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An Economic Analysis of Converting Large Gas- and Oil-Fired Heating Plants to Coal

by
Mike C.J. Lin

Public Law 99-190 requires the Department of Defense to increase the use of coal at its facilities in the United States. This study investigated the cost effectiveness of burning coal (versus gas or oil) in 88 large heating plants located at 55 Army installations in the continental United States. Non-coal-fired plants with capacities greater than 50 MBtu/hr were selected, and the USACERL-developed Central Heating Plant Economic Evaluation (CHPECON) program was used to estimate the life-cycle costs (LCC) of new plants of equal capacity burning gas, No. 2 oil, No. 6 oil, or coal using the following technologies: stokers, coal water slurries, coal-oil mixture, micronized coal, and fluidized bed combustors.

The study concluded that building new coal-fired plants to replace aging gas- or oil-fired plants would be cost effective in only one location, where coal was competitive with gas. However, retrofitting heavy oil plants for coal firing may increase coal consumption and provide potential cost savings for 38 heating plants. Calculated savings ranged between $8 million and $239 million over the 25-year plant life. More detailed engineering studies were recommended to confirm the projected savings at 15 of the Army heating plants studied.

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FOREWORD

This study was conducted for the U.S. Army Center for Public Works (USACPW) under the Coal Conversion Studies Program, which is administered by the Energy Policy Directorate, of the Office of the Assistant Secretary of Defense, Production & Logistics, OASD(P&L/EP). Millard Carr is the Program Manager. Funding was provided under Military Interdepartmental Purchase Request (MIPR) W56HZV-89-AC-01, dated 20 November 1989; Work Unit R-ARMY-TACOM, "Coal Conversion Strategies for the Army, Installation Technical Assistance." The USACPW technical monitor was James F. Donnelly, CECPW-FU-M.

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LTC David J. Rehbein is Commander of USACERL and Dr. L.R. Shaffer is Director.

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AN ECONOMIC ANALYSIS OF CONVERTING LARGE GAS- AND OIL-FIRED HEATING PLANTS TO COAL

1 INTRODUCTION

Background

The Fiscal Year 1986 (FY86) Defense Appropriations Act (PL 99-190, Section 8110) directed the Department of Defense to rehabilitate and convert its existing domestic power plants to burn more coal. The Act set an FY94 coal consumption target of 1.6 million short tons per year beyond the DOD's 1985 U.S. coal consumption. The FY87 Defense Appropriation Act (PL-99-500, Section 9099) reaffirmed the 1.6 million ton target, and added that it should include 300 thousand tons of anthracite coal. The FY87 Defense Authorization Act (PL-99-661, Section 1205) also affects the DOD's coal conversion program by directing that the primary fuel source in any new heating system be the most life-cycle cost effective. This means that the DOD cannot specify a new plant to burn coal unless it can also show that coal will be more economical than oil, gas, or other fuels, over the life of the plant. In addition, the Act amended Section 2690 of Title 10, U.S. Code by canceling previous restrictions against the construction of large new oil or gas heating systems (those with an input rate of 50 million Btu per hour or greater). House Report HR-101-345, which accompanied the FY90 Defense Appropriations Act, stated that "As a related issue, the conferees agree with Senate report language, which directs the Department to continue, without modification, its efforts to increase domestic consumption of coal as outlined in the Department's letter signed by the Assistant Secretary of Defense for Acquisition and Logistics, dated August 30, 1985."

To help the Army comply with these requirements, the U.S. Army Engineering and Housing Support Center (USAEHSC) requested the U.S. Army Construction Engineering Research Laboratories (USACERL) to provide technical studies and support for the Army's coal conversion program. A series of screening and life-cycle cost-estimating models have been developed to determine when and where specific coal combustion technologies could be implemented (Lin December 1992a, December 1993). Potential sites for coal conversion may be identified and ranked by collecting base heating plant information and conducting computer runs with screening and costing models. In general, coal is cheaper than gas and oil on a per-Btu basis, but coal-fired plants require considerably more capital and accrue higher operation and maintenance (O&M) costs due to the additional expense of coal and ash handling equipment, and air pollution control devices. To offset the extra capital and O&M costs, only those plants that use large quantities of fuel or that are located in regions where coal is much cheaper than gas or oil, will realize coal as the lowest life-cycle cost fuel. Therefore, conversion to coal will likely be most effective in large heating plants located relatively close to coal mines. A first step in the Army's coal conversion program is to identify candidate plants, and to estimate and compare the economies of operating these plants with coal and other fuels.

Objectives

The objectives of this study were to identify large gas- or oil-fired heating plants at Army installations, and to determine the economics of coal conversion for each plant.

Approach

1. Candidate Army installation heating plants (with capacities of 50 MBtu/hr or greater) were identified from a USACERL-developed data base of Army heating plant information (the Army Facility Energy Systems Inventory Program [INV]).

2. Data from INV was run through the USACERL-developed Central Heating Plant Economics (CHPECON) program to screen and create cost-estimating models for each identified plant, using several alternatives. Both new and retrofitted plants were considered using coal, No. 2 oil, No. 6 oil or gas as primary fuel. Coal technologies considered for new plants were stoker, coal-oil mixture, coal-water slurry, and fluidized bed combustor. Stoker, coal-water slurry, and micronized coal combustion technologies were considered for retrofitting the heavy oil boilers with coal.

3. Results were analyzed, and conclusions and recommendations were formulated.

Scope

The results are based on current cost estimates for such parameters as future base energy requirements, fuel price, and price escalation. These parameters change through time and as technology advances, so these cost estimates will need to be updated as new data become available. However, the methodology and procedures this study employs can be extended to other federal facilities for similar studies.

2 COAL CONVERSION ECONOMIC STUDY

Army Facility Energy Systems Inventory Program

There are two principal ways to increase coal use in Army heating plants: either to build new coal-fired plants to replace old ones, or to retrofit gas and oil-fired plants for coal-firing. To estimate the relative benefits to the Army of new construction versus retrofit, Army heating plant boiler information must be available. To respond to this need, USACERL started to develop the Army Facility Energy Systems Inventory Program (INV) in 1990. This inventory data base program is designed to hold energy and utility systems information for Army bases, to generate reports about individual bases, to extract information about a large number of bases, and to supply data to other computer programs for further analysis. The program operates on an IBM-compatible personal computer (PC). Data was gathered from a hand-written survey distributed to the bases in the summer of 1990. The survey requested detailed information about 142 installations, their heating plants, and their boilers. The program can print out summary data or detailed reports on individual bases.

One important function of the INV data base is to allow rapid access of energy and utility information for all the listed bases. The inventory programs have prewritten reports that enable the user to extract data by such detailed categories as boiler manufacturer, size, fuel, age, and type of construction. The data itself is stored in dBase format,* a common personal computer data base file format widely known and accessible via custom programs written by any programmer familiar with dBase software. This data also supplies information for evaluating heating plant options.

CHPECON

The Central Heating Plant Economics Evaluation Program (CHPECON) provides the ability to perform evaluations of the life-cycle costs of heating plants with Plant Maximum Continuous Ratings (PMCR) between 50,000 and 600,000 MBtu/hr comprised of individual boilers ranging from 20,000 to 200,000 MBtu/hr. Heating plant fuel choices include coal, gas, and/or oil.

The first step in performing an economic evaluation with CHPECON is to provide answers to the screening models. The screening model allows the user to determine the suitability of a base for a boiler plant with a specific technology. The evaluation can be performed for any of the following options: new plant, new plant with cogeneration (of electricity), new plant with third party (outside ownership) cogeneration, new plant with consolidation of existing plants, or retrofit of a heavy oil plant with a coal technology. The screening model data requirements include a choice of military installation to be studied, the average monthly heating load, the boiler technology, and the fuel type. The boiler technology choices include: (1) dump grate spreader stoker with or without fly ash reinjection; (2) vibrating grate spreader stoker with or without fly ash reinjection; (3) reciprocating grate spreader stoker with or without fly ash reinjection; (4) traveling grate spreader stoker with or without fly ash reinjection; (5) traveling grate stoker; (6) chain grate stoker; (7) coal-oil slurry; (8) coal-water slurry; (9) bubbling bed; (10) circulating bed; and (11) gas- or oil-fired boilers. The screening model also includes general questions about the plant to help calculate a feasibility score that reflects the probability that the proposed plant can be constructed and operated.

*dBase is a registered trademark of Borland International, Inc., 1800-T Green Hill Road, Scotts Valley, CA 95066.

The second step in completing an economic evaluation of a facility is to run the cost model option of CHPECON, which uses the screening model data to calculate costs for a plant. Cost model inputs include fuel prices, the fiscal year of evaluation, current escalation and discount rates, and the expected life of the plant. The cost model calculations predict the cost of boiler fuel and transportation, auxiliary energy, nonenergy operation and maintenance, and repair and replacement over the life of the plant. The cost model report includes itemized plant component costs, capital investment costs, year-by-year operating costs, total life-cycle costs, and levelized plant costs in $/MBtu and $/1000 lb steam (1 lb = 0.453 kg).

CHPECON offers two special options to expedite the analysis of plant options: the multiple run analysis and the sensitivity analysis. The multiple run analysis allows the user to run combined screening and costing models for all the appropriate coal-fired technologies, and provides a list of life-cycle costs for all the technologies in order of increasing cost. Sensitivity analysis automatically varies 11 parameters to show their effects on the plant costs.

CHPECON uses seven data bases, including coal field information, acceptable coal properties (for combustion technology options), military base information, boiler stack emission regulations, equipment emission factors, construction productivity and wage data, and operations labor staffing and wage data. The user can update these data bases from within CHPECON, and (via a system utilities option) reindex files, rebuild a case list from present files, read in new LCCID (life-cycle cost in design) cost information, or set the values for sensitivity analysis.

Both the inventory program and the CHPECON program have been modified to allow CHPECON to extract data directly from the inventory program. This enables analysis of future energy supply alternatives according to the most current data available.

Results for 88 Gas- or Oil-Fired Heating Plants

A search was made using the Army Facility Energy System Inventory program to find the gas- or oil-fired heating plants with capacity greater than 50 MBtu/hr. Eighty-eight heating plants were found that met the criterion (Table 1).*

CHPECON runs were conducted for these plants to compare the life-cycle costs for new plants burning coal, gas, No. 2 oil, and No. 6 oil. In this first-pass economic screening study, several assumptions were made to expedite the CHPECON run. Note that, at the time these runs were made, many features in the program, such as multiple run capability and sensitivity analysis, were not yet available. Therefore, selection of coal and coal technology is not optimized. However, better quality coal (lower ash and sulfur contents) located closer to the base is chosen to minimize transportation and pollution control costs. Information on energy production for each heating plant is not provided in the inventory survey for many bases. This study assumed that the PMCR equals the existing plant maximum capacity, and the plant average load equals one-third of the total plant capacity.

The energy consumption at each installation can be found in the Defense Energy Information System (DEIS) bi-monthly report.** Appendix A lists the 1989 DEIS energy consumption report for the 210 continental U.S. (CONUS) Army installations in order of decreasing energy usage. For the 88 heating plants with capacities greater than 50 MBtu/hr, about half are under the Army Materiel Command (AMC).

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* Tables 1 to 4 are included at the end of Chapter 2.

** The Department of the Army (DA) requires its installations to submit data to the Army DEIS Data Entry System (ADDS) in accordance with DOD 5126.46-M, the *DEIS Manual* (Department of Defense [DOD], February 1990), and Army Regulation (AR) 11-27, *Army Energy Program* (Headquarters, Department of the Army [HQDA], 14 July 1989).

Since little data were available from AMC installations, it is uncertain if the assumption on plant energy production is valid for all cases. By comparing the 1989 DEIS data with the assumed energy productions from the 26 AMC installations, it was found that the estimated production was greater than the entire base consumption for 13 AMC bases. Based on the information obtained from four bases (Forts Bragg, Campbell, and Gordon, and Picatinny Arsenal) where recent plant energy production data were supplied to USACERL, the 1990 average annual heating plants utilization factors (annual average hourly energy production divided by PMCR) were in the range of 15 to 25 percent. This study used a 33 percent factor, which would put coal in a more favorable position since coal use benefits from large-scale fuel consumption. Assumptions made in this study to run the CHPECON program are generally biased toward coal to reveal the favorable conditions required for coal to be cost competitive. If the results are negative, then coal is definitely ruled out as the preferred fuel.

The evaluation was run using most of the CHPECON program's default values. In the gas or oil option, three boilers were selected, while four boilers were chosen for coal plants. Fuel prices used were based on published DOE region prices except for Forts Bragg, Campbell, and Gordon, where reported prices paid by the bases were used.

Appendix B shows the CHPECON results for new plant and retrofit options. The combustion technologies are shown in the first column of the Tables in Appendix B. The second column of each table shows the boiler size in MBtu/hr. The third column shows the average production cost in terms of dollar per MBtu. The fourth column shows the average cost of dollar per 1000 lb of steam. The fifth column shows the investment amount, the sixth column the fuel costs, and the seventh column the 25-year plant life-cycle costs all in thousands of dollars. The last column shows the life-cycle cost ratios with respect to gas when gas was set at 100. For the retrofit option, the investment amount, the cost of coal, the cost of heavy oil (negative values are used for subtraction to calculate savings), and the savings (negative values indicate the amount saved) are shown in thousands of dollars. The results showed that retrofit with coal water slurries resulted in lower life-cycle cost (LCC) as compared to stoker or micronized coal. A similar study conducted by Oak Ridge National Laboratory (ORNL) for the Air Force showed that micronized coal firing resulted in the most economic system (Griffin et al. 1989; Thomas, Griffin, and Young 1989). Fuel pricing may be a key factor for the difference in results.

Table 2 lists the new plant LCC ratios relative to gas firing for the 88 heating plants, alphabetically by base name. Table 3 lists the new plant LCC ratios relative to gas (set at 100), the lowest-cost coal technology, and the least-LCC plant fuel. The LCCs for the new gas-fired plants and the cost penalties incurred while choosing the least-cost coal technology (instead of the least-cost LCC fuel) are also included. Table 3 lists plants in order of increasing cost penalty. The results indicate that using gas or No. 6 oil always resulted in lower new plant life-cycle cost, except for one case (Fort Bragg's plant in Building C-1432) where coal is cost competitive with gas. (The LCC for the coal-fired plant was 2 percent lower than that of the gas-fired plant). These results do not encourage the use of coal as fuel in new Army heating plants built to replace aging plants.

However, Table 4 shows that retrofitting with coal water slurries for the heavy oil plants may result in significant savings (Table 4). Based on the potential savings estimated by CHPECON program, coal retrofit may be a viable option for heating plants located in the following bases: Fort Bragg, Sunflower Army Ammunition Plant, the U.S. Military Academy, Picatinny Arsenal, Fort Detrick, Walter Reed Army Medical Center, Lack City Army Ammunition Plant, Bayonne Military Ocean Terminal, Rocky Mountain Arsenal, Redstone Arsenal, Iowa Army Ammunition Plant, Fort Stewart, Fort Jackson, Fitzsimons Army Medical Center, and Watervliet Arsenal. (Potential LCC savings at those plants may exceed $30 million). However, boiler manufacturers need to be contacted first to evaluate conversion feasibility, and a detailed engineering study should be done to confirm the savings. As mentioned previously, this study assumes high boiler use (33 percent), which would result in greater fuel consumption; savings could be reduced

with less usage. Also note that the CHPECON retrofit models tend to give relatively high savings figures based on their optimistic assumptions regarding reuse of existing equipment and availability of space for add-on equipment. The cost of removing old, unusable equipment may sometimes be rather substantial. A detailed site inspection will help to assess the additional required costs. Expected defense cutbacks that have followed the end of the cold war may preclude new plant construction. Retrofit to coal firing may become the preferred choice in meeting the Congressional intent of doubling DOD coal consumption.

Table 1

Gas and Oil-Fired Army Heating Plants With Capacity Greater Than 50 MBtu/hr

Prefix	#	Base Name	MBtu/hr Fuel*
APG	1	Aberdeen Proving Ground, MD	113.5FS2
—	2	Aberdeen Proving Ground, MD	165FS2
—	3	Aberdeen Proving Ground, MD	150FS2
AMR	4	Army Materials and Mechanics Research Center, MA	87.2FS
BAM	5	Badger Army Ammunition Plant, WI	227.8NG
BAY	6	Bayonne Military Ocean Terminal, NJ	265FS5
CRS	7	Cameron Station, VA	77FS5
DDP	8	Defense Depot, UT	59NG
DPS	9	Defense Personnel Support Center, PA	103.9NG
FSM	10	Fitzsimmons Army Medical Center, CO	224NG
FBV	11	Fort Belvoir, VA	57.3FS
FBH	12	Fort Benjamin Harrison, IN	190NG
FBS	13	Fort Bliss, TX	84NG
FBG	14	Fort Bragg, NC	130NG
—	15	Fort Bragg, NC	125NG
—	16	Fort Bragg, NC	300NG
—	17	Fort Bragg, NC	100NG
—	18	Fort Bragg, NC	50NG
FCB	19	Fort Campbell, KY	62.7NG
—	20	Fort Bragg, NC	115NG
FCS	21	Fort Carson, CO	120NG
FDT	22	Fort Detrick, MD	390NG
FDX	23	Fort Dix, NJ	120FS6
—	24	Fort Dix, NJ	200FS6
—	25	Fort Dix, NJ	772FS4
—	26	Fort Dix, NJ	200FS6
FGM	27	Fort George G. Meade, MD	88FS2
FGD	28	Fort Gordon, GA	70NG
—	29	Fort Gordon, GA	175NG
—	30	Fort Gordon, GA	60NG

* Note: NG = Natural Gas; FS2 = #2 Fuel Oil; FS5 = #5 Fuel Oil; FS6 = #6 Fuel Oil; FSR = Residual Fuel Oil; WUD = Wood.

Table 1 (Cont'd)

Prefix	#	Base Name	MBtu/hr Fuel*
FGL	31	Fort Greely, AK	150FS1
FIT	32	Fort Indiantown Gap, PA	82FS6
FJS	33	Fort Jackson, SC	106NG
—	34	Fort Jackson, SC	178NG
—	35	Fort Jackson, SC	111.2NG
FKX	36	Fort Knox, KY	52FS
—	37	Fort Knox, KY	51.8NG
FLV	38	Fort Leavenworth, KS	60NG
FLW	39	Fort Leonard Wood, MO	61.2FS2
—	40	Fort Leonard Wood, MO	126.8FS6
—	41	Fort Leonard Wood, MO	92FS6
—	42	Fort Leonard Wood, MO	75FS6
FMY	43	Fort Myer, VA	132FS6/NG
FRS	44	Fort Richardson, AK	540NG
FRL	45	Fort Riley, KS	107.8NG
FSD	46	Fort Sheridan, IL	80NG
FSL	47	Fort Sill, OK	58.6NG
FSW	48	Fort Stewart, GA	191.9FS5/WUD
FFA	49	Frankfort Arsenal, PA	85FS
HDD	50	Harry Diamond Laboratory, MD	55NG
HAM	51	Holston Army Ammunition Plant, TN	300NG
IAM	52	Iowa Army Ammunition Plant, IA	192NG
—	53	Iowa Army Ammunition Plant, IA	73FS
—	54	Iowa Army Ammunition Plant, IA	73FS
—	55	Iowa Army Ammunition Plant, IA	73FS
—	56	Iowa Army Ammunition Plant, IA	73FS
FPG	57	Jefferson Proving Ground, IN	72FS
JAM	58	Joliet Army Ammunition Plant, IL	200.8NG
—	59	Joliet Army Ammunition Plant, IL	50.2FS
LCA	60	Lake City Army Ammunition Plant, MO	307NG
LAD	61	Letterkenny Army Depot, PA	76.7FS5
LSA	62	Lonestar Army Ammunition Plant, TX	70NG
—	63	Lonestar Army Ammunition Plant, TX	90NG
—	64	Lonestar Army Ammunition Plant, TX	80NG
—	65	Lonestar Army Ammunition Plant, TX	70NG
—	66	Lonestar Army Ammunition Plant, TX	60NG
MAM	67	McAlester Army Ammunition Plant, OK	73.6NG
NCR	68	Natick Research and Development Center, MA	111.6FS6
NAD	69	New Cumberland Army Depot, PA	84.8FS6
NAM	70	Newport Army Ammunition Plant, IN	75.3NG

* Note: NG = Natural Gas; FS2 = #2 Fuel Oil; FS5 = #5 Fuel Oil; FS6 = #6 Fuel Oil; FSR = Residual Fuel Oil; WUD = Wood.

Table 1 (Cont'd)

Prefix	#	Base Name	MBtu/hr Fuel*
—	71	Newport Army Ammunition Plant, IN	50.2NG
PAR	72	Picatinny Arsenal, NJ	50FS6
—	73	Picatinny Arsenal, NJ	370FS6
RVA	74	Ravenna Army Ammunition Plant, OH	77.1FS
RAR	75	Redstone Arsenal, AL	232NG
—	76	Redstone Arsenal, AL	214NG
RBA	77	Riverbank Army Ammunition Plant, CA	70.1NG
RMA	78	Rocky Mountain Arsenal, CO	230NG
—	79	Rocky Mountain Arsenal, CO	350NG
SAM	80	Scranton Army Ammunition Plant, PA	85NG
SFA	81	Sunflower Army Ammunition Plant, KS	750NG
TAD	82	Tooele Army Depot, UT	60.3FSR
TAM	83	Twin City Army Ammunition Plant, MN	123.3NG
—	84	Twin City Army Ammunition Plant, MN	99NG
UMA	85	West Point Military Academy, NY	129.2FS6
WMC	86	Water Reed Medical Center, Washington DC	58FS6
—	87	Water Reed Medical Center, Washington DC	320NG
WAR	88	Watervliet Arsenal, NY	145.9FS/NG

* Note: NG = Natural Gas; FS2 = #2 Fuel Oil; FS5 = #5 Fuel Oil; FS6 = #6 Fuel Oil; FSR = Residual Fuel Oil; WUD = Wood.

Table 2

LCC Ratios Relative to Gas (100)

Base	PMCR*	#2 Oil	#6 Oil	Coal Stoker	CWS	COM	FBC
APG1	114	129	101	195	173	169	205
APG2	165	132	101	172	161	157	185
APG3	150	132	101	173	162	156	169
AMR	87	110	89	184	159	158	173
BAM	228	113	81	129	125	120	167
BAY	265	112	87	129	126	123	122
CRS	77	127	101	215	187	182	220
DDP	59	110	83	211	181	171	213
DPS	104	111	88	173	151	149	161
FSM	224	113	78	131	131	119	135

* PMCR=Plant Maximum Continuous Ratings; CWS=Coal-Water Slurry; COM=Coal-Oil Mixture; FBC=Fluidized Bed Combustor.

** Indicates actual price paid at military base; other fuel prices based on Department of Energy region.

Table 2 (Cont'd)

Base	PMCR*	#2 Oil	#6 Oil	Coal Stoker	CWS	COM	FBC
FBV	57	124	101	245	204	199	234
FBH	190	113	81	133	131	126	136
FBS	84	127	101	210	184	180	203
FBG1**	130	145	154	132	122	174	128
FBG2**	126	136	145	125	115	163	121
FBG3**	300	149	159	100	102	159	98
FBG4**	100	143	152	143	131	179	139
FBG5**	50	136	144	193	160	203	186
FCB1**	63	116	120	230	198	207	227
FCB2**	115	118	124	188	172	183	192
FCS	120	112	80	163	148	137	158
FDT	390	135	101	140	143	138	139
FDX1	120	111	88	165	147	144	156
FDX2	200	112	87	138	132	129	130
FDX3	77	110	89	192	166	164	181
FDX4	200	112	87	138	132	129	130
FGM	88	127	101	210	185	181	202
FGD1**	70	78	62	138	119	117	139
FGD2**	176	68	57	91	89	87	98
FGD3**	60	72	63	147	125	123	147
FGL	150	112	79	202	149	136	201
FIT	82	110	89	187	163	161	177
FJS1	106	129	101	185	169	167	183
FJS2	178	132	101	155	153	150	156
FJS3	111	130	100	184	167	165	179
FKX1	52	123	101	248	209	205	242
FKX2	52	123	101	248	209	205	242
FLV	60	110	85	207	172	169	202
FLW1	61	110	85	212	177	172	208
FLW2	127	112	82	159	143	138	163
FLW3	92	112	83	176	155	152	177
FLW4	75	111	84	194	166	162	192
FMY	132	130	101	184	168	163	180
FRS	540	113	76	129	119	107	115
FRL	108	112	83	172	144	142	159
FSD	80	111	84	189	165	160	185
FSL	59	125	101	242	199	195	225
FSW	192	132	101	158	156	150	159
FFA	85	110	89	185	162	159	176
HDD	55	123	101	251	207	205	239
HAM	300	134	101	137	145	141	141

* PMCR=Plant Maximum Continuous Ratings; CWS=Coal-Water Slurry; COM=Coal-Oil Mixture; FBC=Fluidized Bed Combustor.

**Indicates actual price paid at military base; other fuel prices based on Department of Energy region.

Table 2 (Cont'd)

Base	PMCR*	#2 Oil	#6 Oil	Coal Stoker	CWS	COM	FBC
IAM1	192	113	81	132	129	124	136
IAM2	73	111	84	193	165	162	190
IAM3	73	111	84	193	165	162	190
IAM4	73	111	84	193	165	162	190
IAM5	73	111	84	193	165	162	190
JPG	72	111	84	195	167	165	196
JAM1	201	113	81	136	132	127	138
JAM2	50	110	86	232	189	186	222
LCA	307	114	80	120	120	115	120
LAD	77	110	89	189	165	163	180
LSA1	70	126	101	225	192	189	215
LSA2	90	128	101	201	179	177	195
LSA3	80	127	101	209	184	181	202
LSA4	70	126	101	225	192	189	215
LSA5	60	125	101	236	199	196	226
MAM	74	126	101	218	188	184	208
NCR	112	111	88	171	149	147	163
NAD	85	110	89	184	162	159	176
NAM1	75	111	84	191	166	162	187
NAM2	50	110	86	226	185	182	217
PAR1	370	113	86	120	122	119	132
PAR2	50	109	90	229	187	186	214
RVA	77	111	84	189	165	162	178
RAR1	232	133	101	155	154	150	149
RAR2	214	133	101	159	156	152	164
RBA	70	110	82	214	183	173	203
RMA1	230	113	78	127	131	120	126
RMA2	370	113	77	113	122	112	114
SAM	85	110	89	185	163	161	176
SFA	600	115	79	88	94	96	85
TAD	60	110	83	212	182	173	202
TAM1	123	112	82	162	143	141	156
TAM2	99	112	83	173	152	149	166
UMA	400	113	86	119	121	119	115
WMC1	58	124	101	240	201	200	228
WMC2	320	134	101	146	148	143	143
WAR	146	111	87	155	143	141	148

* PMCR=Plant Maximum Continuous Ratings; CWS=Coal-Water Slurry; COM=Coal-Oil Mixture; FBC=Fluidized Bed Combustor.

**Indicates actual price paid at military base; other fuel prices based on Department of Energy region.

Table 3

CHPECON Results in Order of Increasing Cost Penalty for New Plants

Base Plant	MBtu/hr PMCR	#2 Oil LCCR	#6 Oil, Gas	COAL @100	Coal Tech.	Least LCC Fuel	LCC (Gas) (M$)	Delta LCCR	Cost Penalty (M$)
FBG3*	300	149	159	98	FBC	COAL	137.9	-2	-2.8
FBG2*	126	136	145	115	CWS	GAS	67.8	15	10.2
FBG1*	130	145	154	122	CWS	GAS	65.1	22	14.3
FBG4*	100	143	152	131	CWS	GAS	52.1	31	16.2
SFA	600	115	79	85	FBC	#6 OIL	282.5	6	17.0
FBG5*	50	136	144	160	CWS	GAS	31.6	60	19.0
NCR	112	111	88	147	COM	#6 OIL	32.4	59	19.1
FSL	59	125	101	195	COM	GAS	28.0	95	26.6
FKX1	52	123	101	205	COM	GAS	25.4	105	26.7
FKX2	52	123	101	205	COM	GAS	25.4	105	26.7
FGD3*	60	72	63	123	COM	#6 OIL	44.5	60	26.7
LSA5	60	125	101	196	COM	GAS	28.0	96	26.9
FLV	60	110	85	169	COM	#6 OIL	32.1	84	27.0
FBV	57	124	101	199	COM	GAS	27.3	99	27.0
MAM	74	126	101	184	COM	GAS	32.4	84	27.2
LSA4	70	126	101	189	COM	GAS	30.7	89	27.3
LSA1	70	126	101	189	COM	GAS	30.7	89	27.3
FGD1*	70	78	62	117	COM	#6 OIL	49.7	55	27.3
FJS1	106	129	101	167	COM	GAS	41.3	67	27.7
HDD	55	123	101	205	COM	GAS	26.4	105	27.7
NAM2	50	110	86	182	COM	#6 OIL	29.0	96	27.8
LSA3	80	127	101	181	COM	GAS	34.4	81	27.9
FJS3	111	130	100	165	COM	GAS	43.0	65	28.0
DDP	59	110	83	171	COM	#6 OIL	31.8	88	28.0
WMC1	58	124	101	200	COM	GAS	28.1	100	28.1
FLW1	61	110	85	172	COM	#6 OIL	32.3	87	28.1
PAR2	50	109	90	186	COM	#6 OIL	29.3	96	28.1
FBS	84	127	101	180	COM	GAS	35.3	80	28.2
FCB1*	63	116	120	198	CWS	GAS	28.9	98	28.3
LSA2	90	128	101	177	COM	GAS	37.0	77	28.5
IAM4	73	111	84	162	COM	#6 OIL	36.6	78	28.5
IAM2	73	111	84	162	COM	#6 OIL	36.6	78	28.5
IAM3	73	111	84	162	COM	#6 OIL	36.6	78	28.5
IAM5	73	111	84	162	COM	#6 OIL	36.6	78	28.5
TAD	60	110	83	173	COM	#6 OIL	31.8	90	28.6
LAD	77	110	89	163	COM	#6 OIL	39.3	74	29.1
JAM2	50	110	86	186	COM	#6 OIL	29.1	100	29.1
NAD	85	110	89	159	COM	#6 OIL	41.8	70	29.3
FFA	85	110	89	159	COM	#6 OIL	41.8	70	29.3
FIT	82	110	89	161	COM	#6 OIL	40.7	72	29.3
FRL	108	112	83	142	COM	#6 OIL	49.7	59	29.3
FGM	88	127	101	181	COM	GAS	36.3	81	29.4
FLW4	75	111	84	162	COM	#6 OIL	37.8	78	29.5
NAM1	75	111	84	162	COM	#6 OIL	37.8	78	29.5

*Calculation uses actual price paid at military base; other fuel prices based on Department of Energy region.

Table 3 (Cont'd)

Base Plant	MBtu/hr PMCR	#2 Oil LCCR	#6 Oil, Gas	COAL @100	Coal Tech.	Least LCC Fuel	LCC (Gas) (M$)	Delta LCCR	Cost Penalty (M$)
AMR	87	110	89	158	COM	#6 OIL	42.8	69	29.5
FDX3	77	110	89	164	COM	#6 OIL	39.4	75	29.6
JPG	72	111	84	165	COM	#6 OIL	36.7	81	29.7
SAM	85	110	89	161	COM	#6 OIL	41.8	72	30.1
DPS	104	111	88	149	COM	#6 OIL	49.5	61	30.2
RVA	77	111	84	162	COM	#6 OIL	38.9	78	30.3
APG1	114	129	101	169	COM	GAS	44.3	69	30.6
FCS	120	112	80	137	COM	#6 OIL	53.7	57	30.6
FSD	80	111	84	160	COM	#6 OIL	40.3	76	30.6
FLW3	92	112	83	152	COM	#6 OIL	44.5	69	30.7
TAM2	99	112	83	149	COM	#6 OIL	46.7	66	30.8
FDX1	120	111	88	144	COM	#6 OIL	55.4	56	31.0
FMY	132	130	101	163	COM	GAS	49.9	63	31.4
FJS2	178	132	101	150	COM	GAS	63.0	50	31.5
FLW2	127	112	82	138	COM	#6 OIL	56.8	56	31.8
FCB2*	115	118	124	172	CWS	GAS	44.2	72	31.8
APG3	150	131	101	158	COM	GAS	55.2	58	32.0
RBA	70	110	82	173	COM	#6 OIL	35.4	91	32.2
TAM1	123	112	82	141	COM	#6 OIL	55.7	59	32.9
FGD2*	176	68	57	87	COM	#6 OIL	112.0	30	33.6
FSW	192	132	101	150	COM	GAS	67.7	50	33.9
APG2	165	132	101	157	COM	GAS	59.9	57	34.1
CRS	77	127	101	204	COM	GAS	33.4	104	34.7
WAR	146	111	87	141	COM	#6 OIL	64.4	54	34.8
IAM1	192	113	81	124	COM	#6 OIL	80.9	43	34.8
HAM	300	134	101	137	STK	GAS	99.9	36	36.0
FBH	190	113	81	126	COM	#6 OIL	80.0	45	36.0
FDX4	200	112	87	129	COM	#6 OIL	86.1	42	36.2
FDX2	200	112	87	129	COM	#6 OIL	86.1	42	36.2
BAM	228	113	81	120	COM	#6 OIL	94.5	39	36.9
FGL	150	112	79	136	COM	#6 OIL	65.0	57	37.1
FSM	224	113	78	119	COM	#6 OIL	91.9	41	37.7
BAY	265	112	87	122	FBC	#6 OIL	109.9	35	38.5
RAR2	214	133	101	152	COM	GAS	74.5	52	38.7
JAM1	201	113	81	127	COM	#6 OIL	85.0	46	39.1
RMA1	230	113	78	120	COM	#6 OIL	94.1	42	39.5
RAR1	232	133	101	150	COM	GAS	79.9	50	40.0
LCA	307	114	80	115	COM	#6 OIL	123.5	35	43.2
WMC2	320	134	101	143	COM	GAS	106.3	43	45.7
PAR1	370	113	86	119	COM	#6 OIL	145.5	33	48.0
FDT	390	135	101	138	COM	GAS	127.8	38	48.6
RMA2	370	113	77	112	COM	#6 OIL	144.4	35	50.5
UMA	400	113	86	119	COM	#6 OIL	160.9	33	53.1
FRS	540	113	76	107	COM	#6 OIL	207.3	31	64.3

*Calculation uses actual price paid at military base; other fuel prices based on Department of Energy region.

Table 4

CHPECON Results in Order of Decreasing Cost Savings for CWS Retrofit

#	Base Plant	MBtu/hr PMCR	Least LCC Fuel	CWS Rft. Savings (M$)	CWS Usage (ton/yr)	Coal Only (ton/yr)	Cumulative Coal Wt (ton/yr)
1	FBG3*	300	COAL	239	84549	59184	59184
2	SFA	600	#6 OIL	154	211869	148308	207493
3	FBG1*	130	GAS	102	36631	25642	233134
4	FBG2*	126	GAS	100	35725	25008	258142
5	UMA	400	#6 OIL	90	112846	78992	337134
6	PAR1	370	#6 OIL	81	104114	72880	410014
7	FDT	390	GAS	79	110350	77245	487259
8	WMC2	320	GAS	65	89937	62956	550215
9	LCA	307	GAS	60	86252	60376	610591
10	BAY	265	#6 OIL	58	74739	52317	662908
11	RMA2	370	#6 OIL	54	104114	72880	735788
12	RAR1	232	GAS	46	65213	45649	781437
13	FDX2	200	#6 OIL	44	56647	39653	821090
14	IAM1	192	#6 OIL	37	54381	38067	859157
15	FSW	192	GAS	37	54381	38067	897224
16	FJS2	178	GAS	35	50128	35090	932313
17	RMA1	230	#6 OIL	34	65381	45767	978080
18	FSM	224	#6 OIL	32	63395	44377	1022456
19	RAR2	214	GAS	31	44828	31380	1053836
20	WAR	146	#6 OIL	31	40716	28501	1082337
21	FMY	132	GAS	26	37312	26118	1108456
22	FDX1	120	#6 OIL	25	33740	23618	1132074
23	TAM1	123	#6 OIL	24	34931	24452	1156525
24	FLW2	127	#6 OIL	24	35443	24810	1181335
25	NCR	112	#6 OIL	24	31472	22030	1203366
26	FJS3	111	GAS	21	31358	21951	1225316
27	FJS1	106	GAS	20	29490	20643	1245959
28	TAM2	99	#6 OIL	19	27786	19450	1265410
29	AMR	87	#6 OIL	19	24610	17227	1282637
30	SAM	85	#6 OIL	18	23536	16475	1299112
31	NAD	85	#6 OIL	17	23536	16475	1315587
32	NAM1	75	#6 OIL	14	21038	14727	1330314
33	RVA	77	#6 OIL	14	22115	15481	1345794
34	WMC1	58	GAS	11	16835	11785	1357579
35	PAR2	50	#6 OIL	11	14575	10203	1367781
36	FBV	57	GAS	11	16274	11392	1379173
37	JAM2	50	#6 OIL	9	14575	10203	1389375
38	TAD	60	#6 OIL	8	17068	11948	1401323
	TOTAL	CWS	(TON /	YEAR)	2001890		

3 CONCLUSIONS AND RECOMMENDATIONS

This initial economic screening study concludes that, in general, it will not be cost effective to build new coal-fired plants to replace aging, large, gas- and oil-fired plants at Army installations. Coal was shown to be cost effective for new construction at only one of 88 studied plants, in a location where coal is price-competitive with gas. However, this study also concludes that it may be cost-effective to retrofit heavy oil plants for coal firing. Potential cost savings for 38 heating plants, estimated using CHPECON, range between $8 million and $239 million during the 25-year plant life.

On-going and expected future defense cutbacks may preclude new plant construction. In light of these cutbacks and the cost-ineffectiveness of new construction of coal-fired plants, retrofit of existing gas- or oil-fired heating plants to coal-firing may become the preferred choice in meeting Army's dual objective of reducing energy costs and meeting the congressional mandate to double the DOD's coal consumption.

This study also calculated the cost penalties incurred by not choosing the fuel with the lowest life-cycle cost. It is recommended that this information be used to increase savings by selecting sites with the lower cost penalties when the DOD is required to increase its coal consumption.

More detailed engineering studies are recommended for the heating plants at 15 Army bases to confirm the savings projected here. Manufacturers of boilers at these sites should be contacted, and the sites should be inspected to assess additional required costs.

Other alternatives should also be considered, such as building large regional plants to serve the thermal and electrical needs of multiple Federal facilities located in a common service territory, or building third-party cogeneration plants.

REFERENCES

Griffin, F.P., J.F. Thomas, R.S. Holcomb, and J.M. Young, ORNL/TM-11100, *Ranking of Air Force Heating Plants Relative to the Economic Benefit of Coal Utilization* (Oak Ridge National Laboratory [ORNL], Oak Ridge, TN, November 1989).

Lin, M.C.J., et al., *Central Heating Plant Economic Evaluation Program*, Draft Technical Report (U.S. Army Construction Engineering Research Laboratories [USACERL], December 1992a).

Lin, M.C.J., L. Thurber, T. Durbin, and R. Tarvin, *Coal Conversion at Picatinny Arsenal and Forts Campbell, Bragg, and Gordon: a Feasibility Study*, Technical Report FE-94/02/ADA277734 (USACERL, December 1993).

Thomas, J.F., F.P. Griffin, and J.M. Young, *Economic Benefit of Coal Utilization/Conversion at Air Force Bases: Screening Study*, ORNL/TM-11113 (ORNL, August 1989).

APPENDIX A: 1989 CONUS Installation Energy Consumption Report

Covers : From January 1989 Through December 1989
Includes : All MACOMS
Installation Ranking by Consumption

Rank	Installation	MBtus/year
1	Fort Richardson, AK	5,220,795
2	Radford Army Ammunition Plant, VA	3,960,608
3	Holston Army Ammunition Plant, TN	3,801,610
4	Fort Bragg, NC	3,117,543
5	Fort Hood, TX	2,873,759
6	Fort Knox, KY	2,718,746
7	Fort Benning, GA	2,717,107
8	Aberdeen Proving Ground, MD	2,541,672
9	Fort Lewis, WA	2,515,574
10	Fort Campbell, KY	2,425,919
11	Redstone Arsenal, AL	2,195,256
12	Fort Riley, KS	1,937,176
13	Fort Ord, CA	1,874,942
14	Fort Dix, NJ	1,793,491
15	Fort George G. Meade, MD	1,719,846
16	Fort Carson, CO	1,706,884
17	Fort Bliss, TX	1,655,909
18	Fort Sill, OK	1,649,784
19	Fort Leonard Wood, MO	1,646,571
20	Sunflower Army Ammunition Plant, KS	1,613,163
21	Fort Stewart, GA	1,601,289
22	Fort Drum, NY	1,536,908
23	Fort Belvoir, VA	1,351,474
24	Fort Jackson, SC	1,342,532
25	Rock Island Arsenal, IL	1,296,026
26	West Point, NY	1,289,720
27	Walter Reed Army Medical Center, Washington DC	1,254,489
28	Fort Devens, MA	1,240,232
29	Picatinny Arsenal, NJ	1,229,515
30	Fort Gordon, GA	1,224,015
31	Fort Polk, LA	1,177,156

Rank	Installation	MBtus/year
32	Fort Sam Houston, TX	1,090,090
33	Presidio Of San Francisco, CA	966,007
34	Fort Rucker, AL	952,015
35	Fort Monmouth, NJ	934,401
36	Pine Bluff Arsenal, AR	930,685
37	Fort Mcclellan, AL	914,909
38	Fort Eustis, VA	907,831
39	Detroit Arsenal, MI	891,238
40	Lake City Army Ammunition Plant, MO	881,996
41	Fort Leavenworth, KS	868,345
42	Red River Army Ammunition Depot, TX	867,540
43	Fort Benjamin Harrison, IN	842,345
44	Fort Huachuca, NM	821,486
45	Stratford Army Engine Plant CT	774,041
47	Lone Star Army Ammunition Plant, TX	747,764
48	Iowa Army Ammunition Plant, IA	745,734
49	Fort Lee, VA	725,970
50	Anniston Army Depot, AL	700,806
51	White Sands Missile Range, NM	666,540
52	Mississippi Army Ammunition Plant, MS	665,458
53	Watervliet Arsenal, NY	661,868
54	Tobyhanna Army Depot, PA	646,374
55	Fort McCoy, WI	646,369
56	Fort Dietrick, MD	630,684
57	Fort Sheridan, IL	609,520
58	Tooele Army Depot, UT	601,416
59	Fitzsimons Army Medical Center, CO	569,836
60	Longhorn Army Ammunition Plant, TX	543,813
61	Lima Army Tank Plant, OH	527,248
62	Letterkenny Army Depot, PA	509,376
63	Fort McPherson, GA	484,372
64	Louisiana Army Ammunition Plant, LA	478,393
65	New Cumberland Army Depot, PA	432,960
66	Fort Hamilton, NY	414,203
67	Fort Irwin, CA	409,088

Rank	Installation	MBtus/year
68	Scranton Army Ammunition Plant, PA	403,900
69	Fort Myer, VA	400,128
70	Charleston Army District, SC	345,633
71	Corpus Christi Army Depot, TX	341,924
72	Bayonne Military Ocean Terminal, NJ	336,471
73	Fort Ritchie, MD	336,323
74	Dugway Proving Ground, UT	315,211
75	McAlister Army Ammunition Plant, OK	303,012
77	Joliet Army Ammunition Plant, IL	279,146
78	Norfolk Army District, VA	264,526
79	Lexington Bluegrass Army Depot, KY	261,240
80	Riverbank Army Ammunition Plant, CA	260,607
81	Twin Cities Army Ammunition Plant, MN	259,886
82	New Orleans Army District, LA	253,040
83	Kansas Army Ammunition Plant, KS	252,916
84	Harry Diamond Laboratory, MD	250,856
85	Memphis Army District, TN	241,621
86	Sacramento Army Depot, CA	237,383
87	Fort Chaffee, AR	231,468
88	Carlisle Barracks, PA	230,078
89	Pueblo Depot Activity, CO	228,781
90	Baltimore Army District, MD	227,760
91	Hawthorne Army Ammunition Plant, NV	218,533
92	Fort Monroe, VA	202,581
93	Milan Army Ammunition Plant, TN	199,012
94	Vicksburg Army District, MS	190,291
95	Indiana Army Ammunition Plant, IN	182,625
96	Rocky Mountain Arsenal, CO	180,873
97	Cameron Station, VA	180,853
98	Michigan Army National Guard, MI	179,729
99	Seneca Army Depot, NY	175,371
100	St Louis Area Support Center, MO	171,058
101	St. Louis Army Ammunition Plant, MO	165,891
102	U.S. Army Natick Research & Development Center, MA	156,968
103	Vint Hill Farms Station , VA	150,481

Rank	Installation	MBtus/year
104	U.S. Army Waterways Experiment Station, MS	145,831
105	Mobile Army District, AL	139,117
106	Materials Technology Laboratory, MA	131,041
107	Yuma Proving Ground, AZ	128,895
108	Savannah Depot Activity, IL	128,584
109	Arkansas Army National Guard, AK	128,538
110	California Army National Guard, CA	125,851
111	Sierra Army Depot, NV	118,299
112	Military Traffic Management Control, Western Area, CA	111,840
113	Sharpe Army Depot, CA	109,986
114	Mississippi Army National Guard, MS	103,051
115	Philidelphia Army District, PA	101,658
117	Indiana Army National Guard, IN	93,468
118	Fort Leslie J. McNair, Washington, DC	85,073
119	Arlington Hall Station, VA	80,319
120	Newport Army Ammunition Plant, IN	79,686
121	New York Army National Guard, NY	77,991
122	Rock Island, IL	76,629
123	Minnesota Army National Guard, MN	73,709
124	Pennsylvania Army National Guard, PA	71,281
125	Ravenna Army Ammunition Plant, OH	71,167
127	New Jersey Army National Guard, NJ	63,078
128	Alabama Army National Guard, AL	62,884
129	Jefferson Proving Ground, IN	62,884
130	Idaho Army National Guard, ID	62,454
131	Wilmington, Delaware District, DE	60,550
132	Massachusetts Army National Guard, MA	59,886
133	Detroit Army District, MI	58,148
134	Little Rock Army District, AK	57,759
135	Oklahoma Army National Guard, OK	57,185
136	Alaska Army National Guard, AK	57,014
137	Utah Army National Guard, UT	52,925
138	Tennessee Army National Guard, TN	52,315
140	Iowa Army National Guard, IA	51,369
141	Omaha Army District, NE	50,544

Rank	Installation	MBtus/year
142	Huntington Army District, WV	48,294
143	Georgia Army National Guard, GA	46,796
144	Connecticut Army National Guard, CT	46,358
145	U.S. Army Cold Regions Research & Engineering Laboratory, NH	44,255
146	North Dakota Army National Guard, ND	43,787
147	Badger Army Ammunition Plant, WI	43,072
148	Oregon Army National Guard, OR	42,999
149	Wisconsin Army National Guard, WI	42,548
150	Illinios Army National Guard, IL	41,813
152	Pittsburgh Army District, PA	38,517
153	Ohio Army National Guard, OH	37,413
154	Kansas City Army District, MO	37,304
155	Umatilla Depot Activity, OR	36,955
156	Louisiana Army National Guard, LA	36,596
157	Florida Army National Guard, FL	34,938
158	Missouri Army National Guard, MO	33,548
159	Vermont Army National Guard, VT	32,363
160	Kansas Army National Guard, KS	31,854
161	Louisville Army District, KY	31,074
162	Montana Army National Guard, MT	30,961
163	Tulsa Army District, OK	30,707
164	New York Army District, NY	30,636
165	Washington Army National Guard, WA	29,659
166	Texas Army National Guard, TX	29,253
167	Kentucky Army National Guard, KY	28,860
168	Rhode Island Army National Guard. RI	27,740
169	U.S. Army Construction Engineering Research Laboratories, IL	26,930
170	Arizona Army National Guard, AZ	26,168
171	Maine Army National Guard, ME	25,857
172	New Mexico Army National Guard, NM	25,855
173	Colorado Army National Guard, CO	25,332
174	Virginia Army National Guard, VA	25,031
175	Maryland Army National Guard, MD	24,876
176	Walla Walla Army District, WA	24,845
177	Wyoming Army National Guard, WY	23,131

Rank	Installation	MBtus/year
178	North Carolina Army National Guard, NC	23,023
179	West Virginia Army National Guard, WV	22,840
180	South Carolina Army National Guard, SC	22,242
181	Fort Wingate Depot Activity, NM	21,617
182	Nebraska Army National Guard, NE	21,509
183	St. Louis Army Ammunition Plant, MO	21,281
184	South Dakota Army National Guard, SD	21,061
185	Nevada Army National Guard, NV	20,401
186	Buffalo Army District, NY	19,326
187	Delaware Army National Guard, DE	18,689
188	Fort Worth Army District, TX	17,531
189	Sacramento Army District, CA	17,208
190	81st Army Command, GA	15, 591
191	Sunny Point Military Ocean Terminal, NC	15,101
192	89th Army Command, KS	15,078
193	Cornhusker Army Ammunition Plant, NE	14,355
194	U.S. Army, Northeast Division, MA	13,949
195	Seattle Army District, WA	12,352
196	Volunteer Army Ammunition Plant, TN	12,342
197	Nashville Army District, TN	12,183
198	New Hampshire Army National Guard, NH	9,710
199	San Francisco Army District, CA	9,248
200	St. Paul Army District, MN	8,416
201	U.S. Army Medical Center, Washington DC	7,422
202	Albuquerque Army District, NM	7,051
203	District Of Columbia Army National Guard, Washington DC	5,637
204	Jacksonville Army District, FL	3,720
205	Pontiac Storage Facility, MI	3,238
206	Los Angeles Army District, CA	2,672
207	Galveston Army District, TX	2,367
208	Alaska Army District, AK	1,011
209	Chicago Army District, IL	78
210	Fort A.P. Hill, VA	0

APPENDIX B:
CHPECON Run Results for 88 U.S. Army Heating Plants

Table B1

CHPECON Results for Aberdeen Proving Ground, File Prefix: APG1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	38/38/38	8.952	10.703	5530	30896	44302	100
#2 Oil	38/38/38	11.587	13.853	5530	43937	57343	129
#6 Oil	38/38/38	9.050	10.820	5530	31380	44786	101
Stoker	26/45/45/45	17.491	20.912	43344	16879	86561	195
CWS	23/45/57/57	14.839	17.741	31756	23312	76743	173
COM	27/47/47/47	14.511	17.349	25863	29199	75044	169
FBC	21/42/53/53	18.370	21.964	41160	23332	90912	205

Base: Aberdeen Proving Ground
File Prefix: APG1 L=(k# Steam/hr)
PMCR: 114 L M=(mbtu/hr)
Ave Mon. Load: 38 M
CHP #1 4@ 16 M Fuel = FS2 Age = 1941
1@ 33.5 M Fuel = FS2 Age = 1985

Table B2

CHPECON Results for Aberdeen Proving Ground, File Prefix: APG2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	56/56/56	8.364	10.000	6852	44568	59908	100
#2 Oil	56/56/56	10.999	13.150	6852	63443	78784	132
#6 Oil	56/56/56	8.462	10.117	6852	45269	60610	101
Stoker	38/64/64/64	14.396	17.212	49703	23757	103120	172
CWS	33/65/82/82	12.900	15.420	39150	33274	96560	161
COM	39/68/68/68	12.547	15.001	30327	41840	93914	157
FBC	30/60/76/76	15.481	18.510	47790	33328	110891	185

Base: Aberdeen Proving Ground
File Prefix: APG2 L=(K# Steam/hr)
PMCR: 165 L M=(MBtu/HR)
Ave Mon. Load: 55 M
CHP #2 3@ 55 M Fuel = FS2 Age = 1952

Table B3

CHPECON Results for Aberdeen Proving Ground, File Prefix: APG3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	50/50/50	8.476	10.000	6852	44568	59908	100
#2 Oil	50/50/50	11.111	13.150	6852	63443	78784	132
#6 Oil	50/50/50	8.574	10.117	6852	45269	60610	101
Stoker	34/59/59/59	15.123	18.081	47417	21048	95743	173
CWS	30/59/75/75	13.465	16.099	37027	29737	89257	162
COM	36/62/62/62	13.003	15.546	28641	37231	86193	156
FBC	27/54/69/69	14.699	17.574	44565	22040	93062	169

Base: Aberdeen Proving Ground
File Prefix: APG3 L=(K# STEAM/HR)
PMCR: 150 L M=(MBtu/HR)
Ave Mon. Load: 50 M
CHP #3 1@ 20 M Fuel = FS2 Age = 1977
2@ 30 M Fuel= FS2 Age= 1975
2@ 35 M Fuel = FS2 Age = 1953

Table B4

CHPECON Results for Army Materials and Mech. Research Center, File Prefix: AMR

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	29/29/29	11.337	13.555	5155	30054	42818	100
#2 Oil	29/29/29	12.505	14.951	5155	34465	47229	110
#6 Oil	29/29/29	10.046	12.011	5155	25178	37924	89
Stoker	20/34/34/34	20.816	24.887	40712	14232	78616	184
CWS	17/34/44/44	17.263	20.640	29447	17979	68134	159
COM	21/36/36/36	17.123	20.472	24815	23387	67579	158
FBC	16/32/41/41	19.646	23.488	37669	13292	74197	173

Retrofit Technology	Boiler	K$INV	K$Coal	K$HVY Oil	Savings
Stoker	12/22/22/22	3678	12584	-28797	-12533
CWS	10/18/18/18	1933	16291	-37013	-18787
M-Coal	10/18/18/18	4227	12328	-28209	-11654

Base: Army Materials and Mech. Research Center
File Prefix: AMR L=(K# STEAM/HR)
PMCR: 87.2 L M=(MBtu/HR)
Ave Mon. Load: 29 M
CHP #1 3@ 24.6 M Fuel = FS Age = 1956
1@ 13.4 M Fuel = FS Age = 1976

Table B5

CHPECON Results for Badger AAMP, File Prefix: BAM

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	76/76/76	9.543	11.410	8487	76794	94460	100
#2 Oil	76/76/76	10.816	12.931	8487	89388	107054	113
#6 Oil	76/76/76	7.705	9.212	8487	58598	76264	81
Stoker	52/89/89/89	12.267	14.667	59558	29896	121418	129
CWS	45/89/114/114	11.409	13.041	50570	40636	118009	125
COM	54/93/93/93	10.987	13.136	37210	52851	113641	120
FBC	42/83/105/105	15.902	19.013	61420	59047	107399	167

Base: Badger AAMP
File Prefix: BAM — L=(K# STEAM/HR)
PMCR: 227.8 L — M=(MBtu/HR)
Ave Mon. Load: 76 M
CHP #1 4@ 6.7 M Fuel = NG/FS — Age = 1959
5@ 50.2 M Fuel = NG/FS — Age = 1943

Table B6

CHPECON Results for Bayonne, File Prefix: BAY

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	89/89/89	9.589	11.465	9591	90714	109903	100
#2 Oil	89/89/89	12.862	10.757	9591	104098	123288	112
#6 Oil	89/89/89	8.298	9.922	9591	75917	95107	87
Stoker	60/103/103/103	12.329	14.741	65179	37810	141305	129
CWS	52/104/132/132	11.602	13.872	57377	53042	138956	126
COM	63/108/108/108	11.333	13.549	41788	69015	135725	123
FBC	48/96/122/122	11.727	14.021	62606	37133	134401	122

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	54/54/54/76	4901	35685	-87236	-46649
CWS	45/45/45/63	4428	49476	-112404	-58499
M-COAL	45/45/45/63	6403	32981	-81565	-42180

Base: Bayonne MOT
File Prefix: BAY — L=(K# STEAM/HR)
PMCR: 265 L — M=(MBTU/HR)
Ave Mon. Load: 88 M
CHP #1 3@ 60 M Fuel = FS5 — Age = 1941
1@ 85 M Fuel = FS5 — Age = 1971

Table B7

CHPECON Results for Cameron Station, File Prefix: CRS

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	26/26/26	9.871	11.802	4716	21228	33424	100
#2 Oil	26/26/26	12.506	14.952	4716	30151	42347	127
#6 Oil	26/26/26	9.969	11.919	4716	21559	33755	101
Stoker	18/30/30/30	24.380	29.150	37721	11597	82557	247
CWS	15/30/39/39	20.530	24.550	26647	15918	69522	208
COM	19/32/32/32	20.140	24.080	22484	19896	68184	204
FBC	14/20/36/36	23.290	27.850	35279	15569	78880	236

Base: Cameron Station
File Prefix: CRS — L=(K# STEAM/HR)
PMCR: 77 L — M=(MBtu/HR)
Ave Mon. Load: 26 M
CHP #1 6@ 13 M Fuel = FS5 — Age = 1942,1945,1965
2 Boilers for each year

Table B8

CHPECON Results for Defense Depot, File Prefix: DDP

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	12.223	14.614	4450	20085	31838	100
#2 Oil	20/20/20	13.416	16.040	4450	23191	34944	110
#6 Oil	20/20/20	10.134	12.116	4450	14643	26396	83
Stoker	14/23/23/23	25.767	30.808	36651	9101	671155	211
CWS	12/23/30/30	21.186	25.330	25071	13948	576644	181
COM	14/25/25/25	19.968	23.874	21656	14034	54350	171
FBC	11/22/28/28	26.069	31.169	34741	11188	67902	213

Base: Defense Depot
File Prefix: DDP — L=(K# STEAM/HR)
PMCR: 59 L — M=(MBtu/HR)
Ave Mon. Load: 20 M
CHP #1 1@ 15.5 M Fuel = NG/FS — Age = 1971
5@ 8.7 M Fuel = NG/FS — Age = 1953

Table B9

CHPECON Results for Defense Personnel Support Center, File Prefix: DPS

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	35/35/35	10.87	12.997	5525	36238	49549	100
#2 Oil	35/35/35	12.038	14.397	5525	41562	54873	111
#6 Oil	35/35/35	9.579	11.453	5525	30353	43664	88
Stoker	24/41/41/41	18.828	22.512	44198	15718	85827	173
CWS	21/41/52/52	15.753	18.835	32184	21518	75037	151
COM	25/43/43/43	15.529	18.566	26186	28054	73968	149
FBC	19/38/48/48	17.549	20.981	39922	14969	79990	161

Base: Defense Personel Support Center
File Prefix: DPS L=(K# STEAM/HR)
PMCR: 103.9 L M=(MBtu/HR)
Ave Mon. Load: 35 M
CHP #1 2@ 35.2 M Fuel = NG/FS Age = 1941
1@ 33.5 M Fuel = NG/FS Age = 1985

Table B10

CHPECON Results for Fitzsimmons Army Medical Center, File Prefix: FSM

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	75/75/75	9.405	11.245	8098	74617	91864	100
#2 Oil	75/75/75	10.597	12.670	8098	86265	103513	113
#6 Oil	75/75/75	7.316	8.747	8098	54211	71459	78
Stoker	51/87/87/87	12.335	14.748	57572	30854	120487	131
CWS	44/88/112/112	11.750	14.057	47041	46305	120012	131
COM	53/92/92/92	10.729	12.827	35006	50971	149511	119
FBC	41/81/104/104	12.687	15.169	55277	35735	123923	135

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	46/46/54/54	4602	28105	-60689	-27981
CWS	39/39/45/45	3994	43175	-79138	-31968
M-Coal	39/39/45/45	5879	26423	-56803	-24500

Base: Fitzsimmons Army Medical Center
File Prefix: FSM L=(K# STEAM/HR)
PMCR: 224 L M=(MBtu/HR)
Ave Mon. Load: 75 M
CHP #1 2@ 52 M Fuel = NG/FS6 Age = 1943
2@ 60 M Fuel = NG/FS6 Age = 1947

Table B11

CHPECON Results for Fort Belvoir, File Prefix: FBV

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	11.016	13.170	4382	15600	27258	100
#2 Oil	20/20/20	13.651	16.321	4382	22121	33779	124
#6 Oil	20/20/20	11.097	13.268	4382	15843	27459	101
Stoker	13/23/23/23	27.010	32.290	35797	9191	66836	245
CWS	12/23/29/29	21.532	25.744	23916	12240	55676	204
COM	14/24/24/24	21.025	25.138	21000	14762	54366	198
FBC	11/21/27/27	25.803	30.850	33133	9126	63846	234

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	19/19/19	2868	7072	-17339	-7398
CWS	14/14/14	1672	10612	-23185	-10901
M-Coal	14/14/14	1666	10347	-22566	-10553

Base: Fort Belvoir
File Prefix: FBV
PMCR: 57.3 L
Ave Mon. Load: 19 M
CHP #1 3@ 19.1 M Fuel = FS

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1956

Table B12

CHPECON Results for Fort Ben Harrison, File Prefix: FBH

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	64/64/64	9.755	11.663	7624	63182	80037	100
#2 Oil	64/64/64	11.027	13.184	7624	74121	90476	113
#6 Oil	64/64/64	7.624	9.465	7624	48599	64954	81
Stoker	43/74/74/74	13.004	15.547	55066	23074	106694	133
CWS	37/74/95/95	12.201	14.588	45814	33821	104616	131
COM	45/78/78/78	11.726	14.019	34507	43769	100536	126
FBC	35/69/88/88	13.286	15.885	52065	27810	109009	136

Base: Fort Ben Harrison
File Prefix: FBH
PMCR: 190 L
Ave Mon. Load: 63 M
CHP #1 1@ 60 M Fuel = NG
1@ 50 M Fuel = NG
1@ 80 M Fuel = NG

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1988
Age = 1989
Age = 1989

Table B13

CHPECON Results for Fort Bliss, File Prefix: FBS

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	28/28/28	9.667	11.559	4843	22832	35253	100
#2 Oil	28/28/28	12.303	14.709	4843	32441	44863	127
#6 Oil	28/28/28	9.765	11.676	4843	23189	35610	101
Stoker	19/33/33/33	20.285	24.252	37143	14169	73968	210
CWS	17/33/42/42	16.986	20.308	26607	17498	64726	184
COM	20/35/35/35	16.613	19.863	22070	21968	63307	180
FBC	16/31/39/39	19.596	23.429	35005	13059	71458	203

Base: Fort Bliss
File Prefix: FBS — L=(K# STEAM/HR)
PMCR: 84 L — M=(MBtu/HR)
Ave Mon. Load: 28 M
CHP #1 4@ 14 M Fuel = NG/FS2 — Age = 1939
2@ 14 M Fuel = NG/FS2 — Age = 1942

Table B14

CHPECON Results for Fort Bragg, File Prefix: FBG1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	44/44/44	11.619	13.891	5715	51276	65067	100
#2 Oil	44/44/44	16.826	20.117	5715	80433	94224	145
#6 Oil	44/44/44	17.915	21.420	5715	86537	100328	154
Stoker	30/51/51/51	15.310	18.305	41825	17324	85737	132
CWS	26/51/65/65	13.515	16.159	31118	25665	79092	122
COM	31/53/53/53	19.358	23.145	25001	67880	113287	174
FBC	24/47/60/60	14.884	17.795	39757	17565	83350	128

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	23/23/23/23/23	4500	15732	-93136	-72903
CWS	19/19/19/19/19	3211	23886	-129165	-102068
M-Coal	19/19/19/19/19	5302	15107	-90291	-69881

Base: Fort Bragg
File Prefix: FBG1 — L=(K# STEAM/HR)
PMCR: 130 L — M=(MBtu/HR)
Ave Mon. Load: 43 M
CHP #1 3@ 26 M Fuel = NG/FS6 — Age = 1965
1@ 26 M Fuel = NG/FS6 — Age = 1969
1@ 26 M Fuel = NG/FS6 — Age = 1978

Table B15

CHPECON Results for Fort Bragg, File Prefix: FBG2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	42/42/42	11.656	13.936	5625	50088	67757	100
#2 Oil	42/42/42	16.863	20.161	5625	78568	92237	136
#6 Oil	42/42/42	17.953	21.464	5625	84529	98198	145
Stoker	29/49/49/49	15.490	18.521	41320	16975	84731	125
CWS	25/49/63/63	13.650	16.321	30776	25051	78026	115
COM	30/52/52/52	19.358	23.144	24442	65901	110648	163
FBC	23/46/58/58	15.049	17.992	39269	17147	82311	121

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	34/34/45	3361	15381	-91056	-72314
CWS	28/28/37	2273	23295	-125967	-100400
M-COAL	28/28/37	3904	14764	-88234	-69565

Base: Fort Bragg
File Prefix: FBG2 L=(K# STEAM/HR)
PMCR: 126 L M=(MBtu/HR)
Ave Mon. Load: 42 M
CHP #2 2@ 37.9 L Fuel = NG,FS2 Age = 1972
1@ 50 L Fuel = NG,FS2 Age = 1952

Table B16

CHPECON Results for Fort Bragg, File Prefix: FBG3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	100/100/100	10.588	12.659	9051	118957	137895	100
#2 Oil	100/100/100	15.795	18.884	9051	186764	205702	149
#6 Oil	100/100/100	16.885	20.187	9051	200957	219895	159
Stoker	68/117/117/117	10.538	12.599	62367	38337	137239	100
CWS	59/117/150/150	10.372	12.401	53143	58437	141162	102
COM	71/123/123/123	16.138	19.295	37872	156267	219633	159
FBC	54/108/138/138	10.388	12.420	60181	40010	135292	98

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	90/90/90	4575	36441	-215732	-174717
CWS	75/75/75	3787	55131	-298123	-239205
M-Coal	75/75/75	5888	35296	-210934	-169750

Base: Fort Bragg
File Prefix: FBG3 L=(K# STEAM/HR)
PMCR: 300 L M=(MBtu/HR)
Ave Mon. Load: 100 M
CHP #3 3@ 100 L Fuel = NG,FS6 Age = 1953

Table B17

CHPECON Results for Fort Bragg, File Prefix: FBG4

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	34/34/34	12.133	14.506	5028	39387	52145	100
#2 Oil	34/34/34	17.340	20.732	5028	61764	74522	143
#6 Oil	34/34/34	18.430	22.034	5028	66447	79205	152
Stoker	23/39/39/39	17.292	20.675	37447	13377	74318	143
CWS	20/39/50/50	15.209	18.184	27421	19703	68307	131
COM	24/41/41/41	20.829	24.905	22346	51578	93547	179
FBC	18/36/46/46	16.875	20.176	35433	13658	72526	139

Base: Fort Bragg
File Prefix: FBG4 L=(K# STEAM/HR)
PMCR: 100 L M=(MBtu/HR)
Ave Mon. Load: 33 M
CHP #4 2@ 50 L Fuel = NG,FS2 Age = 1973

Table B18

CHPECON Results for Fort Bragg, File Prefix: FBG5

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	17/17/17	14.287	17.082	4020	20398	31631	100
#2 Oil	17/17/17	19.494	23.307	4020	31926	43159	136
#6 Oil	17/17/17	20.584	24.610	4020	34339	45572	144
Stoker	12/20/20/20	27.603	33.002	32334	7595	61111	193
CWS	10/20/25/25	21.877	26.150	21129	10605	50615	160
COM	12/21/21/21	27.791	33.227	18719	27526	64296	203
FBC	9/18/23/23	26.575	31.774	30190	7501	58837	186

Base: Fort Bragg
File Prefix: FBG5 L=(K# STEAM/HR)
PMCR: 50 L M=(MBtu/HR)
Ave Mon. Load: 17 M
CHP #5 2@ 25 L Fuel = NG,FS6 Age = 1985

Table B19

CHPECON Results for Fort Campbell, File Prefix: FCB1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	21/21/21	10.565	12.631	4400	17161	28894	100
#2 Oil	21/21/21	12.216	14.605	4400	21677	33410	116
#6 Oil	21/21/21	12.680	15.161	4400	22947	34680	120
Stoker	15/25/25/25	24.347	29.109	35693	9360	66587	230
CWS	13/25/32/32	20.018	23.933	24269	13190	57211	198
COM	15/26/26/26	20.916	25.007	20867	20198	59778	207
FBC	12/23/29/29	24.023	28.721	33204	10837	65699	227

Base: Fort Campbell
File Prefix: FCB1 L=(K# STEAM/HR)
PMCR: 63 L M=(MBtu/HR)
Ave Mon. Load: 21 M
CHP #1 2@ 25.1 L Fuel = NG,FS2 Age = 1985
1@ 12.5 L Fuel = NG,FS2 Age = 1958

Table B20

CHPECON Results for Fort Campbell, File Prefix: FCB2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	39/39/39	8.933	10.680	5495	30835	44209	100
#2 Oil	39/39/39	10.584	12.654	5495	39006	52381	118
#6 Oil	39/39/39	11.049	13.210	5495	41305	54679	124
Stoker	26/45/45/45	16.817	20.106	42349	15622	83224	188
CWS	23/45/58/58	14.684	17.556	31094	23159	75940	172
COM	28/47/47/47	15.628	18.685	25296	35545	80823	183
FBC	21/42/53/53	17.108	20.455	39995	19198	84667	192

Base: Fort Campbell
File Prefix: FCB2 L=(K# STEAM/HR)
PMCR: 115 L M=(MBtu/HR)
Ave Mon. Load: 38 M
CHP #2 1@ 15 L Fuel = NG,FS2 Age = 1976
2@ 50 L Fuel = NG,FS2 Age = 1976

Table B21

CHPECON Results for Fort Carson, File Prefix: FCS

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	40/40/40	10.302	12.317	5774	39909	53667	100
#2 Oil	40/40/40	11.494	13.743	5774	46122	59879	112
#6 Oil	40/40/40	8.213	9.819	5774	29026	42784	80
Stoker	27/47/47/47	16.769	20.049	44412	17441	87357	163
CWS	24/47/60/60	14.592	17.447	32460	24999	79437	148
COM	29/49/49/49	13.527	16.173	26080	27385	73640	137
FBC	22/44/56/56	16.264	19.445	40979	17641	84724	158

Base: Fort Carson
File Prefix: FCS
PMCR: 120 L
Ave Mon. Load: 40 M
CHP #1 3@ 40 M Fuel = NG/DF2

L=(K# STEAM/HR)
M=(MBtu/HR)
Age = 1966

Table B22

CHPECON Results for Fort Detrick, File Prefix: FDT

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	130/130/130	7.547	9.023	11489	104948	127773	100
#2 Oil	130/130/130	10.182	12.174	11489	149563	172387	135
#6 Oil	130/130/130	7.645	9.140	11489	106605	129430	101
Stoker	88/152/152/152	10.672	12.760	82553	51654	178332	140
CWS	76/152/194/194	10.298	12.313	70581	77787	182201	143
COM	93/159/159/159	9.969	11.918	49662	97816	176368	138
FBC	71/141/180/180	10.493	12.545	77766	58109	177653	139

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	58/58/58/58/117	6193	48988	-121919	-66739
CWS	48/48/48/48/97	5877	71955	-157212	-79380
M-Coal	48/48/48/48/97	8671	48093	-119693	-62929

Base: Fort Detrick
File Prefix: FDT
PMCR: 390 L
Ave Mon. Load: 130 M
CHP #1 2@ 65 M Fuel = NG/FS6
1@ 130 M Fuel = NG/FS6
2@ 65 M Fuel = NG/FS6

L=(K# STEAM/HR)
M=(MBtu/HR)
Age = 1956
Age = 1966
Age = 1990

Table B23

CHPECON Results for Fort Dix, File Prefix: FDX1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	40/40/40	10.637	12.718	6058	41373	55415	100
#2 Oil	40/40/40	11.805	14.115	6058	47457	61499	111
#6 Oil	40/40/40	9.346	11.175	6058	34647	48689	88
Stoker	27/47/47/47	17.567	21.003	46919	17925	91512	165
CWS	24/47/60/60	14.994	17.927	35273	24374	81625	147
COM	29/49/49/49	14.709	17.586	28328	31568	80072	144
FBC	22/44/56/56	16.587	19.831	43424	16960	86406	156

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	36/36/36	3306	15753	-38902	-19842
CWS	30/30/30	2212	21779	-49396	-25405
M-Coal	30/30/30	3821	15289	-37758	-18647

Base: Fort Dix
File Prefix: FDX1 L=(K# STEAM/HR)
PMCR: 120 L M=(MBtu/HR)
Ave Mon. Load: 40 M
CHP #1 3@ 40 M Fuel = FS6 Age = 1958

Table B24

CHPECON Results for Fort Dix, File Prefix: FDX2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	67/67/67	9.863	11.792	8047	69109	86064	100
#2 Oil	67/67/67	11.031	13.189	8047	79301	96256	112
#6 Oil	67/67/67	8.572	10.249	8047	57845	74800	87
Stoker	45/78/78/78	13.569	16.223	58000	28968	118397	138
CWS	39/78/100/100	12.489	14.932	47989	40403	113883	132
COM	48/82/82/82	12.188	14.572	35936	52571	111136	129
FBC	36/72/92/92	12.818	15.325	53482	28228	111847	130

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	45/45/45/45	4455	26983	-66742	-35303
CWS	37/37/37/37	3741	37500	-85196	-43955
M-Coal	37/37/37/37	5609	26267	-64970	-33094

Base: Fort Dix
File Prefix: FDX2 L=(K# STEAM/HR)
PMCR: 200 L M=(MBtu/HR)
Ave Mon. Load: 67 M
CHP #2 3@ 50 M Fuel = FS6 Age = 1953
1@ 50 M Fuel = FS6 Age = 1963

Table B25

CHPECON Results for Fort Dix, File Prefix: FDX3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	26/26/26	11.63	13.904	4923	36974	39379	100
#2 Oil	26/26/26	12.798	15.301	4923	30929	43334	110
#6 Oil	26/26/26	10.336	12.358	4923	22605	35000	89
Stoker	18/30/30/30	22.341	26.711	40419	12035	95647	192
CWS	15/30/39/39	18.466	22.079	28804	16242	65342	166
COM	19/32/32/32	18.234	21.800	24306	21142	64569	164
FBC	14/28/36/36	21.031	25.144	37099	11343	71211	181

Base: Fort Dix
File Prefix: FDX3 L=(K# STEAM/HR)
PMCR: 77.2 L M=(MBtu/HR)
Ave Mon. Load: 26 M
CHP #3 2@ 38.6 M Fuel = FS4 Age = 1972

Table B26

CHPECON Results for Fort Dix, File Prefix: FDX4

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC
Gas	67/67/67	9.863	11.792	8047	69109	86064
#2 Oil	67/67/67	11.031	13.189	8047	79301	96256
#6 Oil	67/67/67	8.572	10.249	8047	57845	74800
Stoker	45/78/78/78	13.569	16.223	58000	28968	118397
CWS	39/78/100/100	12.489	14.932	47989	40403	113883
COM	48/82/82/82	12.188	14.572	35936	52571	111136
FBC	36/72/92/92	12.818	15.325	53482	28228	111847

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	45/45/45/45	4455	26983	-66742	-35303
CWS	37/37/37/37	3741	37500	-85196	-43955

Base: Fort Dix
File Prefix: FDX4 L=(K# STEAM/HR)
PMCR: 200 L M=(MBtu/HR)
Ave Mon. Load: 67 M
CHP #4 2@ 50 M Fuel = FS6 Age = 1964
2@ 50 M Fuel = FS6 Age = 1965

Table B27

CHPECON Results for Fort George Meade, File Prefix: FGM

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	30/30/30	9.618	11.499	5079	23635	36326	100
#2 Oil	30/30/30	12.253	14.650	5079	33588	46279	127
#6 Oil	30/30/30	9.716	11.617	5079	24005	36696	101
Stoker	20/35/35/35	20.253	24.214	39496	13283	76486	210
CWS	18/35/44/44	17.031	20.363	28376	18117	67217	185
COM	21/36/36/36	16.614	19.863	23861	22327	65569	181
FBC	16/32/41/41	19.458	23.264	36744	13488	73489	202

Base: Fort George Meade
File Prefix: FGM — L=(K# STEAM/HR)
PMCR: 88 L — M=(MBtu/HR)
Ave Mon. Load: 29 M
CHP #1 2@ 40 M Fuel = FS2 — Age = 1953
2@ 8 M Fuel = FS2 — Age = 1954

Table B28

CHPECON Results for Fort Gordon, File Prefix: FGD1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	24/24/24	16.583	19.826	4498	37779	49672	100
#2 Oil	24/24/24	12.867	15.384	4498	26650	38543	78
#6 Oil	24/24/24	10.330	12.350	4498	19049	30942	62
Stoker	16/28/28/28	22.824	27.289	35846	10360	68368	138
CWS	14/28/35/35	18.869	22.559	24739	14323	59062	119
COM	17/29/29/29	18.556	22.186	21252	17932	58085	117
FBC	13/26/33/33	23.106	27.625	33669	12729	69211	139

Base: Fort Gordon
File Prefix: FGD1 — L=(K# STEAM/HR)
PMCR: 70 L — M=(MBtu/HR)
Ave Mon. Load: 23 M
CHP #1 2@ 35 L Fuel = NG,FS2 — Age = 1975

Table B29

CHPECON Results for Fort Gordon, File Prefix: FGD2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	59/59/59	14.574	17.425	6890	96487	111986	100
#2 Oil	59/59/59	9.875	11.806	6890	60379	75877	68
#6 Oil	59/59/59	8.322	9.950	6890	48444	63942	57
Stoker	40/69/69/69	13.204	15.787	48926	24030	101461	91
CWS	35/69/88/88	12.368	14.788	39405	35329	99314	89
COM	42/72/72/72	12.071	14.432	30081	44823	96923	87
FBC	32/64/81/81	14.250	17.037	47540	31837	109495	98

Base: Fort Gordon
File Prefix: FGD2 L=(K# STEAM/HR)
PMCR: 176 L M=(MBtu/HR)
Ave Mon. Load: 59 M
CHP #2 3@ 35.9 L Fuel = NG,FS Age = 1965
3@ 34 L Fuel = NG,FS Age = 1967

Table B30

CHPECON Results for Fort Gordon, File Prefix: FGD3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	17.082	20.424	4300	32891	44494	100
#2 Oil	20/20/20	12.383	14.805	4300	20651	32253	72
#6 Oil	20/20/20	10.829	12.948	4300	16605	28207	63
Stoker	14/24/24/24	25.071	29.975	34817	9059	65302	147
CWS	12/24/30/30	20.493	24.502	23517	12607	55780	125
COM	15/25/25/25	20.118	24.053	20307	15791	54759	123
FBC	11/22/28/28	25.192	30.119	32522	11122	65616	147

Base: Fort Gordon
File Prefix: FGD3 L=(K# STEAM/HR)
PMCR: 60 L M=(MBtu/HR)
Ave Mon. Load: 20 M
CHP #3 2@ 30 L Fuel = NG,FS2 Age = 1972

Table B31

CHPECON Results for Fort Greely, File Prefix: FGL

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	50/50/50	9.984	11.937	6918	49816	65017	100
#2 Oil	50/50/50	11.177	13.363	6918	57581	72782	112
#6 Oil	50/50/50	7.895	9.440	6918	36212	51413	79
Stoker	34/59/59/59	20.210	24.163	56363	44656	131601	202
CWS	30/59/75/75	14.278	17.071	42836	31263	97161	149
COM	35/62/62/62	12.983	15.522	33074	34437	88343	136
FBC	27/54/69/69	15.902	19.012	50675	25089	103548	201

Base: Fort Greely
File Prefix: FGL
PMCR: 150 L
Ave Mon. Load: 50 M
CHP #1 3@ 50 M Fuel = FS1

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1954

Table B32

CHPECON Results for Fort Indiantown Gap, File Prefix: FIT

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	28/28/28	11.568	13.831	5126	28001	40677	100
#2 Oil	28/28/28	12.736	15.227	5126	32107	44784	110
#6 Oil	28/28/28	10.277	12.287	5126	23460	36137	89
Stoker	19/32/32/32	21.589	25.812	40605	11893	75914	187
CWS	16/32/41/41	18.001	21.522	28990	16669	66145	163
COM	20/34/34/34	17.824	21.310	24420	21859	65493	161
FBC	15/30/38/38	20.448	24.447	37438	11471	71900	177

Base: Fort Indiantown Gap
File Prefix: FIT
PMCR: 82 L
Ave Mon. Load: 27 M
CHP #1 2@ 41 M Fuel = FS6/FS2

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1940

Table B33

CHPECON Results for Fort Jackson, File Prefix: FJS1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	36/36/36	9.061	10.833	5029	28483	41302	100
#2 Oil	36/36/36	11.696	13.984	5029	40495	53313	129
#6 Oil	36/36/36	9.159	10.950	5029	28929	41748	101
Stoker	24/42/42/42	16.801	20.088	37017	14614	76583	185
CWS	21/42/53/53	14.632	17.494	26878	21454	69696	169
COM	26/44/44/44	14.449	17.276	21935	27128	68827	167
FBC	20/39/49/49	16.583	19.826	35255	15455	75586	183

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	32/32/32	3209	12198	-29390	-13983
CWS	26/26/26	2090	18749	-40890	-20050
M-Coal	26/26/26	3662	11935	-28652	-13054

Base: Fort Jackson
File Prefix: FJS1 L=(K# STEAM/HR)
PMCR: 106 L M=(MBtu/HR)
Ave Mon. Load: 35 M
CHP #1 3@ 35.6 M Fuel = NG/FS6 Age = 1965

Table B34

CHPECON Results for Fort Jackson, File Prefix: FJS2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	60/60/60	8.200	9.804	6608	47785	63005	100
#2 Oil	60/60/60	10.835	12.954	6608	68034	83254	132
#6 Oil	60/60/60	8.297	9.921	6608	48538	63758	101
Stoker	41/69/69/69	12.721	15.209	45617	23263	97745	155
CWS	35/70/89/89	12.636	14.390	36215	35825	96645	153
COM	43/73/73/73	11.753	14.052	27739	44605	94373	150
FBC	33/65/82/82	12.817	15.324	44145	25609	98485	156

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	32/32/32/32/32	4813	20854	-50332	-24665
CWS	26/26/26/26/26	3702	32687	-71416	-35027
M-Coal	26/26/26/26/26	5924	20598	-49766	-23244

Base: Fort Jackson
File Prefix: FJS2 L=(K# STEAM/HR)
PMCR: 178 L M=(MBtu/HR)
Ave Mon. Load: 59 M
CHP #2 3@ 35.6 M Fuel = NG/FS6 Age = 1969
1@ 35.6 M Fuel = NG/FS6 Age = 1974
1@ 35.6 M Fuel = NG/FS6 Age = 1987

Table B35

CHPECON Results for Fort Jackson, File Prefix: FJS3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	37/37/37	8.931	10.677	5094	30092	43032	100
#2 Oil	37/37/37	11.565	13.828	5094	42789	55730	130
#6 Oil	37/37/37	9.028	10.794	5094	30563	43504	100
Stoker	25/44/44/44	16.397	19.605	36392	15252	79013	184
CWS	22/44/56/56	14.292	17.088	27628	22757	71968	167
COM	27/46/46/46	14.110	16.870	22537	28592	71051	165
FBC	20/40/52/52	15.998	19.127	35791	16220	77088	179

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	32/32/36	3243	12779	-30790	-14767
CWS	26/26/30	2134	19937	-43481	-21410
M-Coal	26/26/30	3719	12546	-30964	-13964

Base: Fort Jackson
File Prefix: FJS3 L=(K# STEAM/HR)
PMCR: 111.2 L M=(MBtu/HR)
Ave Mon. Load: 37 M
CHP #3 2@ 35.6 M Fuel = NG/FS6 Age = 1972
1@ 40.0 M Fuel = NG/FS6 Age = 1985

Table B36

CHPECON Results for Fort Knox, File Prefix: FKX1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	18/18/18	11.488	13.735	4224	13992	25433	100
#2 Oil	18/18/18	14.123	16.886	4224	19827	31268	123
#6 Oil	18/18/18	11.586	13.852	4224	14209	25650	101
Stoker	12/21/21/21	28.514	34.091	34569	7324	63128	248
CWS	11/21/26/26	22.983	27.479	22913	10927	53174	209
COM	13/22/22/22	22.503	26.904	20274	13297	52061	205
FBC	10/19/24/24	27.794	33.231	32024	8202	61535	242

Base: Fort Knox
File Prefix: FKX1 L=(K# STEAM/HR)
PMCR: 52 L M=(MBtu/HR)
Ave Mon. Load: 17 M
CHP #1 2@ 26 M Fuel = FS Age = 1966

Table B37

CHPECON Results for Fort Knox, File Prefix: FKX2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	18/18/18	11.488	13.735	4224	13992	25433	100
#2 Oil	18/18/18	14.123	16.886	4224	19827	31268	123
#6 Oil	18/18/18	11.586	13.852	4224	14209	25650	101
Stoker	12/21/21/21	28.514	34.091	34569	7324	63128	248
CWS	11/21/26/26	22.983	27.479	22913	10927	53174	209
COM	13/22/22/22	22.503	26.904	20274	13297	52061	205
FBC	10/19/24/24	27.794	33.231	32024	8202	61535	242

Base: Fort Knox
File Prefix: FKX2 L=(K# STEAM/HR)
PMCR: 51.8 L M=(MBtu/HR)
Ave Mon. Load: 17 M
CHP #2 2@ 17.4 M Fuel = NG/FS Age = 1957
1@ 17.0 M Fuel = NG/FS Age = 1957

Table B38

CHPECON Results for Fort Leavenworth, File Prefix: FLV

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	12.312	14.720	4355	20409	32068	100
#2 Oil	20/20/20	13.584	16.214	4355	23724	35382	110
#6 Oil	20/20/20	10.473	12.522	4355	15621	27279	85
Stoker	14/24/24/24	25.453	30.431	35514	9474	66255	207
CWS	12/24/30/30	20.254	24.215	24087	11383	55127	172
COM	15/25/25/25	17.881	23.770	20799	14653	54113	169
FBC	11/22/28/28	24.832	29.689	33016	9921	64679	202

Base: Fort Leavenworth
File Prefix: FLV L=(K# STEAM/HR)
PMCR: 60 L M=(MBtu/HR)
Ave Mon. Load: 20 M
CHP #1 3@ 20 M Fuel = NG/FS2 Age = 1960

Table B39

CHPECON Results for Fort Leonard Wood, File Prefix: FLW1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	21/21/21	12.417	14.864	4629	20407	32342	100
#2 Oil	21/21/21	13.689	16.367	4629	23721	35656	110
#6 Oil	21/21/21	10.578	12.647	4629	15619	27553	85
Stoker	14/24/24/24	26.410	31.576	38485	8997	68789	212
CWS	12/24/31/31	21.101	25.228	26560	11208	57434	177
COM	15/25/25/25	20.559	24.580	22880	14420	55958	172
FBC	11/22/29/29	25.961	31.039	35431	10451	67620	208

Base: Fort Leonard Wood
File Prefix: FLW1 L=(K# STEAM/HR)
PMCR: 61.2 L M=(MBtu/HR)
Ave Mon. Load: 20 M
CHP #1 2@ 17.2 M Fuel = PPG Age = 1966
2@ 13.4 M Fuel = FS2 Age = 1972

Table B40

CHPECON Results for Fort Leonard Wood, File Prefix: FLW2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	43/43/43	10.388	12.420	6219	42556	56821	100
#2 Oil	43/43/43	11.660	13.541	6219	49516	63781	112
#6 Oil	43/43/43	8.541	10.212	6177	32500	46721	82
Stoker	29/50/50/50	16.513	19.743	47472	17331	90322	159
CWS	25/50/64/64	14.241	17.027	36418	22763	81403	143
COM	31/52/52/52	13.736	16.423	28833	29377	78516	138
FBC	23/46/59/59	16.892	20.197	44693	21339	92398	163

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	17/17/26/26/26	4481	15388	-38313	-18445
CWS	14/14/21/21/21	3180	20511	-47303	-23613
M-Coal	14/14/21/21/21	5263	15143	-37705	-17299

Base: Fort Leonard Wood
File Prefix: FLW2 L=(K# STEAM/HR)
PMCR: 128.2 L M=(MBtu/HR)
Ave Mon. Load: 42 M
CHP #2 3@ 29.0 M Fuel = FS6 Age = 1966
2@ 19.9 M Fuel = FS6 Age = 1963

Table B41

CHPECON Results for Fort Leonard Wood, File Prefix: FLW3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	31/31/31	11.020	13.176	5355	31470	44491	100
#2 Oil	31/31/31	12.293	14.697	5355	36607	49628	112
#6 Oil	31/31/31	9.182	10.928	5355	24048	37069	83
Stoker	21/36/36/36	19.341	23.124	42141	13070	78085	176
CWS	18/36/46/46	16.387	19.593	31228	16984	69136	155
COM	22/38/38/38	15.996	19.124	25908	22090	67484	152
FBC	17/34/43/43	19.514	23.331	39351	15904	78782	177

Base: Fort Leonard Wood
File Prefix: FLW3 L=(K# STEAM/HR)
PMCR: 92 L M=(MBtu/HR)
Ave Mon. Load: 31 M
CHP #3 2@ 46 M Fuel = FS6 Age = 1969

Table B42

CHPECON Results for Fort Leonard Wood, File Prefix: FLW4

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	25/25/25	11.597	13.865	4870	25435	37758	100
#2 Oil	25/25/25	12.869	15.387	4870	29578	41901	111
#6 Oil	25/25/25	9.758	11.667	4870	19450	31772	86
Stoker	17/30/30/30	22.482	26.880	40068	10908	73197	196
CWS	15/30/38/38	18.454	22.064	28704	13851	62787	166
COM	18/31/31/31	17.985	21.503	24203	17977	61192	162
FBC	14/27/35/35	22.320	26.686	37063	12884	72670	192

Base: Fort Leonard Wood
File Prefix: FLW4 L=(K# STEAM/HR)
PMCR: 75.2 L M=(MBtu/HR)
Ave Mon. Load: 25 M
CHP #4 1@ 10.7 M Fuel = FS6 Age = 1959
3@ 21.5 M Fuel = FS6 Age = 1959

Table B43

CHPECON Results for Fort Myers, File Prefix: FMY

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	44/44/44	8.699	10.401	6026	35721	49850	100
#2 Oil	44/44/44	11.355	13.552	6026	50822	64951	130
#6 Oil	44/44/44	8.797	10.518	6026	35282	50412	101
Stoker	30/52/52/52	16.007	19.138	45483	19015	91923	184
CWS	26/52/66/66	13.948	16.676	34231	26905	83523	168
COM	32/54/54/54	13.592	16.251	27507	33521	81393	163
FBC	24/48/61/61	15.624	18.681	42702	20336	89533	180

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	23/23/36/36	3988	16775	-41197	-20434
CWS	19/19/30/30	3022	24330	-53158	-25806
M-Coal	19/19/30/30	4778	16548	-40640	-19314

Base: Fort Myers
File Prefix: FMY — L=(K# STEAM/HR)
PMCR: 132 L — M=(MBtu/HR)
Ave Mon. Load: 44 M
CHP #1 2@ 26 M Fuel = FS6 — Age = 1977
1@ 40 M Fuel = NG/FS6 — Age = 1972
1@ 40 M Fuel = NG/FS6 — Age = 1990

Table B44

CHPECON Results for Fort Riley, File Prefix: FRL

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	36/36/36	10.600	12.673	5359	36519	49696	100
#2 Oil	36/36/36	11.872	14.194	5359	42454	55661	112
#6 Oil	36/36/36	8.761	10.475	5359	27900	41077	83
Stoker	25/42/42/42	18.241	21.809	42535	17977	85520	172
CWS	21/42/54/54	14.570	17.420	30205	19741	71383	144
COM	26/44/44/44	14.400	17.216	24977	25720	70549	142
FBC	20/39/50/50	16.859	20.157	38227	15897	79041	159

Base: Fort Riley
File Prefix: FRL — L=(K# STEAM/HR)
PMCR: 107.8 L — M=(MBtu/HR)
Ave Mon. Load: 36 M
CHP #1 2@ 53.9 M Fuel = NG/FS2 — Age = 1956

Table B45

CHPECON Results for Fort Richardson, File Prefix: FRS

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	180/180/180	8.843	10.573	15200	178697	207306	100
#2 Oil	180/180/180	10.036	11.999	15200	206651	235260	113
#6 Oil	180/180/180	6.754	8.075	15200	129725	158334	76
Stoker	122/210/210/210	11.370	13.594	103330	116742	266542	129
CWS	105/210/269/269	10.033	11.995	97606	110254	245778	119
COM	128/220/220/220	9.013	10.776	66703	121903	220787	107
FBC	98/195/249/249	10.590	12.146	105460	82978	238151	115

Base: Fort Richardson
File Prefix: FRS L=(K# STEAM/HR)
PMCR: 540 L M=(MBtu/HR)
Ave Mon. Load: 180 M
CHP #1 4@ 135 M Fuel = NG/FS1 Age = 1952

Table B46

CHPECON Results for Fort Sheridan, File Prefix: FSD

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	27/27/27	11.455	13.696	5284	27449	40281	100
#2 Oil	27/27/27	12.728	15.217	5284	31923	44754	111
#6 Oil	27/27/27	9.617	11.498	5284	20984	33816	84
Stoker	18/31/31/31	21.664	25.902	42556	11167	76178	189
CWS	16/32/40/40	18.054	21.585	30866	15012	66339	165
COM	19/33/33/33	17.561	20.996	26012	19324	64528	160
FBC	15/29/37/37	21.192	25.338	39044	12748	74518	185

Base: Fort Sheridan
File Prefix: FSD L=(K# STEAM/HR)
PMCR: 80 L M=(MBtu/HR)
Ave Mon. Load: 27 M
CHP #1 2@ 40 M Fuel = NG/FS2 Age = 1966

Table B47

CHPECON Results for Fort Sill, File Prefix: FSL

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	10.748	12.850	4285	16408	27995	100
#2 Oil	20/20/20	13.383	16.001	4285	23272	34859	125
#6 Oil	20/20/20	10.846	12.967	4285	16663	28250	101
Stoker	14/23/23/23	26.074	31.174	35325	11127	67912	242
CWS	12/23/30/30	20.486	24.493	23378	12736	55760	199
COM	14/25/25/25	20.015	23.930	20198	15621	54478	195
FBC	11/22/28/28	24.219	28.956	32254	9328	63082	225

Base: Fort Sill
File Prefix: FSL L=(K# STEAM/HR)
PMCR: 58.6 L M=(MBtu/HR)
Ave Mon. Load: 20 M
CHP #1 2@ 10.0 M Fuel = NG/FS2 Age = 1979
2@ 9.7 M Fuel = NG/FS2 Age = 1982
1@ 8.0 M Fuel = NG/FS2 Age = 1986
1@ 11.2 M Fuel = NG/FS2 Age = 1988

Table B48

CHPECON Results for Fort Stewart, File Prefix: FSW

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	64/64/64	8.125	9.715	7163	51805	67727	100
#2 Oil	64/64/64	10.761	12.866	7163	72769	89691	132
#6 Oil	64/64/64	8.224	9.832	7163	52621	68543	101
Stoker	44/75/75/75	12.835	15.345	50729	27214	106977	158
CWS	38/75/96/96	12.101	14.468	41504	38792	105401	156
COM	46/79/79/79	11.696	13.984	31092	48464	101872	150
FBC	35/70/89/89	12.952	15.485	48405	30214	107954	159

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	43/43/52/85	4383	24162	-55235	-26689
CWS	36/36/43/71	3642	34575	-75405	-37188
M-Coal	36/36/43/71	5490	23679	-54130	-24961

Base: Fort Stewart
File Prefix: FSW L=(K# STEAM/HR)
PMCR: 191.9 L M=(MBtu/HR)
Ave Mon. Load: 64 M
CHP #1 2@ 48.5 M Fuel = FS5/FS2 Age = 1976
1@ 57.8 M Fuel = FS5/FS2 Age = 1978
1@ 94.9 M Fuel = WUD/FS2 Age = 1983

Table B49

CHPECON Results for Frankfort Arsenal, File Prefix: FFA

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	29/29/29	11.460	13.702	5182	29027	41790	100
#2 Oil	29/29/29	12.628	15.098	5182	33286	46049	110
#6 Oil	29/29/29	10.169	12.158	5182	24319	37082	89
Stoker	20/33/33/33	21.216	25.366	40978	12835	77366	185
CWS	17/34/43/43	17.735	21.204	29719	17228	67581	162
COM	21/35/35/35	17.416	20.823	24592	22494	66365	159
FBC	16/31/40/40	20.181	24.128	37936	12493	73591	176

Base: Frankfort Arsenal
File Prefix: FFA L=(K# STEAM/HR)
PMCR: 85 L M=(MBtu/HR)
Ave Mon. Load: 28 M
CHP #1 2@ 20.8 M Fuel = FS Age = 1942
1@ 20.1 M Fuel = FS Age = 1941
1@ 23.6 M Fuel = FS Age = 1955

Table B50

CHPECON Results for Harry Diamond Labs, File Prefix: HDD

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	19/19/19	11.253	13.454	4336	14796	26379	100
#2 Oil	19/19/19	13.888	16.605	4336	20974	32557	123
#6 Oil	19/19/19	11.351	13.571	4336	15025	26609	101
Stoker	13/22/22/22	28.232	33.755	35690	8763	66182	251
CWS	11/22/28/28	22.343	26.713	23813	11484	54732	207
COM	13/23/23/23	22.027	26.336	20938	14478	53959	205
FBC	10/20/26/26	26.893	32.153	32969	8607	63041	239

Base: Harry Diamond Labs
File Prefix: HDD L=(K# STEAM/HR)
PMCR: 55 L M=(MBtu/HR)
Ave Mon. Load: 18 M
CHP #1 1@ 5.0 M Fuel = NG/FS Age = 1972
4@ 12.5 M Fuel = NG/FS Age = 1975

Table B51

CHPECON Results for Holston AAMP, File Prefix: HAM

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	100/100/100	7.677	9.178	9306	80793	99907	100
#2 Oil	100/100/100	10.312	12.330	9306	11512	134306	134
#6 Oil	100/100/100	7.779	9.297	9306	82069	101263	101
Stoker	68/117/117/117	10.512	12.568	64652	37390	136904	137
CWS	59/117/150/150	10.675	12.763	55872	59827	145281	145
COM	71/123/123/123	10.343	12.366	39728	75542	140764	141
FBC	54/108/138/138	10.842	12.962	62365	43251	141197	141

Base: Holston AAMP
File Prefix: HAM
PMCR: 300 L
Ave Mon. Load: 100 M
CHP #1 3@ 100 M Fuel = NG

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = ?

Table B52

CHPECON Results for Iowa AAMP, File Prefix: IAM1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	64/64/64	9.706	11.604	7454	64687	80899	100
#2 Oil	64/64/64	10.978	13.126	7454	75282	91505	117
#6 Oil	64/64/64	7.868	9.407	7454	49365	65577	81
Stoker	44/75/75/75	12.860	15.375	53545	24994	107186	132
CWS	38/75/96/96	11.953	14.291	44524	34482	104111	129
COM	46/79/79/79	11.496	13.745	33268	44551	100135	124
FBC	35/70/89/89	13.180	15.758	50829	29798	109854	136

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	43/43/43/43	4400	22800	-58232	-31032
CWS	36/36/36/36	3656	31470	-72578	-37452
M-Coal	36/36/36/36	5511	22320	-57006	-29175

Base: Iowa AAMP
File Prefix: IAM1
PMCR: 192 L
Ave Mon. Load: 64 M
CHP #1 4@ 48 Fuel = NG/FS

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1948

Table B53

CHPECON Results for Iowa AAMP, File Prefix: IAM2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	25/25/25	11.706	13.995	4732	24429	36587	100
#2 Oil	25/25/25	12.978	15.517	4732	28406	40564	111
#6 Oil	25/25/25	9.868	11.797	4732	18683	30841	84
Stoker	17/29/29/29	22.644	27.073	38345	10303	70776	193
CWS	15/29/37/37	18.483	22.098	26854	13412	60369	165
COM	18/30/30/30	18.112	21.655	23004	17189	59159	162
FBC	14/27/34/34	22.259	26.613	35556	11630	69573	190

Base: Iowa AAMP
File Prefix: IAM2 L=(K# STEAM/HR)
PMCR: 73 L M=(MBtu/HR)
Ave Mon. Load: 24 M
CHP #2 2@ 36.6 Fuel = FS Age = 1941

Table B54

CHPECON Results for Iowa AAMP, File Prefix: IAM3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	25/25/25	11.706	13.995	4732	24429	36587	100
#2 Oil	25/25/25	12.978	15.517	4732	28406	40564	111
#6 Oil	25/25/25	9.868	11.797	4732	18683	30841	84
Stoker	17/29/29/29	22.644	27.073	38345	10303	70776	193
CWS	15/29/37/37	18.483	22.098	26854	13412	60369	165
COM	18/30/30/30	18.112	21.655	23004	17189	59159	162
FBC	14/27/34/34	22.259	26.613	35556	11630	69573	190

Base: Iowa AAMP
File Prefix: IAM3 L=(K# STEAM/HR)
PMCR: 73 L M=(MBtu/HR)
Ave Mon. Load: 24 M
CHP #3 2@ 36.2 Fuel = FS Age = 1941

Table B55

CHPECON Results for Iowa AAMP, File Prefix: IAM4

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	25/25/25	11.706	13.995	4732	24429	36587	100
#2 Oil	25/25/25	12.978	15.517	4732	28406	40564	111
#6 Oil	25/25/25	9.868	11.797	4732	18683	30841	84
Stoker	17/29/29/29	22.644	27.073	38345	10303	70776	193
CWS	15/29/37/37	18.483	22.098	26854	13412	60369	165
COM	18/30/30/30	18.112	21.655	23004	17189	59159	162
FBC	14/27/34/34	22.259	26.613	35556	11630	69573	190

Base: Iowa AAMP
File Prefix: IAM4 L=(K# STEAM/HR)
PMCR: 73 L M=(MBtu/HR)
Ave Mon. Load: 24 M
CHP #4 2@ 36.2 M Fuel = FS Age = 1941

Table B56

CHPECON Results for Iowa AAMP, File Prefix: IAM5

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	25/25/25	11.706	13.995	4732	24429	36587	100
#2 Oil	25/25/25	12.978	15.517	4732	28406	40564	111
#6 Oil	25/25/25	9.868	11.797	4732	18683	30841	84
Stoker	17/29/29/29	22.644	27.073	38345	10303	70776	193
CWS	15/29/37/37	18.483	22.098	26854	13412	60369	165
COM	18/30/30/30	18.112	21.655	23004	17189	59159	162
FBC	14/27/34/34	22.259	26.613	35556	11630	69573	190

Base: Iowa AAMP
File Prefix: IAM5 L=(K# STEAM/HR)
PMCR: 73 L M=(MBtu/HR)
Ave Mon. Load: 24 M
CHP #5 2@ 36.6 M Fuel = FS Age = 1941

Table B57

CHPECON Results for Jefferson Proving Grounds, File Prefix: JPG

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	24/24/24	11.728	14.023	4806	24433	36659	100
#2 Oil	24/24/24	13.001	15.544	4806	28407	40636	111
#6 Oil	24/24/24	9.890	11.825	4806	18684	30912	84
Stoker	17/28/28/28	22.913	27.397	39560	9958	71618	195
CWS	14/28/36/36	18.773	22.445	27887	13357	61317	167
COM	18/30/30/30	18.481	22.096	23982	17420	60363	165
FBC	13/26/34/34	23.003	27.502		11574	71897	196

Base: Jefferson Proving Grounds
File Prefix: JPG L=(K# STEAM/HR)
PMCR: 72 L M=(MBtu/HR)
Ave Mon. Load: 24 M
CHP #1 3@ 24 M Fuel = FS Age = 1972

Table B58

CHPECON Results for Joliet AAMP, File Prefix: JAM1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	67/67/67	9.737	11.641	8311	67741	84961	100
#2 Oil	67/67/67	11.009	13.163	8311	78843	96063	113
#6 Oil	67/67/67	7.899	9.444	8311	51702	68920	81
Stoker	46/78/78/78	13.256	15.849	59481	25184	115665	136
CWS	40/79/100/100	13.344	14.759	50675	35963	112561	132
COM	48/82/82/82	11.805	14.114	37843	46760	107644	127
FBC	37/73/93/93	13.473	16.109	55683	30277	117563	138

Base: Joliet AAMP
File Prefix: JAM1 L=(K# STEAM/HR)
PMCR: 201 L M=(MBtu/HR)
Ave Mon. Load: 67 M
CHP #1 2@ 100.4 M Fuel = NG/FS Age = 1941

Table B59

CHPECON Results for Joliet AAMP, File Prefix: JAM2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	17/17/17	13.163	15.737	4543	17385	29142	100
#2 Oil	17/17/17	14.435	17.259	4543	20202	31958	110
#6 Oil	17/17/17	11.324	13.539	4543	13314	25071	86
Stoker	12/20/20/20	30.572	36.552	39033	7670	67684	232
CWS	10/20/25/25	23.849	28.514	26422	9853	55177	189
COM	12/21/21/21	23.414	27.994	23435	12685	54171	186
FBC	9/18/23/23	29.193	34.903	35415	8086	64631	222

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	9/18/18	2831	5904	-15631	-6896
CWS	7/15/15	1612	8435	-19453	-9406
M-Coal	7/15/15	3038	5668	-15005	-6300

Base: Joliet AAMP
File Prefix: JAM2 L=(K# STEAM/HR)
PMCR: 50 L M=(MBtu/HR)
Ave Mon. Load: 17 M
CHP #2 1@ 10 M Fuel = FS Age = 1950
2@ 20.1 M Fuel = FS Age = 1955

Table B60

CHPECON Results for Letterkeny Army Depot, File Prefix: LAD

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	26/26/26	11.615	13.886	4781	26977	39328	100
#2 Oil	26/26/26	12.783	15.283	4781	30931	43283	110
#6 Oil	26/26/26	10.323	12.343	4871	22605	34956	89
Stoker	18/30/30/30	21.988	26.289	39869	11391	24452	189
CWS	15/30/39/39	18.337	21.924	28348	16242	64886	165
COM	19/32/32/32	18.125	21.670	23920	21142	64134	163
FBC	14/28/36/36	20.963	25.063	36725	11463	70980	180

Base: Letterkeny Army Depot
File Prefix: LAD L=(K# STEAM/HR)
PMCR: 77 L M=(MBtu/HR)
Ave Mon. Load: 26 M
CHP #1 2@ 27.2 M Fuel = FS5 Age = 1952
1@ 22.3 M Fuel = FS5 Age = 1952

Table B61

CHPECON Results for Lake City AAMP, File Prefix: LCA

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	103/103/103	9.296	11.114	10090	102977	123485	100
#2 Oil	103/103/103	10.568	12.635	10090	119879	140386	114
#6 Oil	103/103/103	7.458	8.916	10090	78558	99065	80
Stoker	70/119/119/119	11.149	13.329	71300	40814	148098	120
CWS	60/120/153/153	10.652	12.735	63202	54224	147865	120
COM	73/125/125/125	10.254	12.260	45139	70878	142351	115
FBC	56/121/142/142	11.157	13.340	67707	43734	148216	120

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	67/67/67/72	5190	38329	-92257	-48737
CWS	56/56/56/60	4872	49913	-115113	-60327
M-Coal	56/56/56/60	6917	37822	-91035	-46296

Base: Lake City AAMP
File Prefix: LCA — L=(K# STEAM/HR)
PMCR: 307 L — M=(MBtu/HR)
Ave Mon. Load: 102 M
CHP #1 3@ 75.5 M Fuel = NG/FS — Age = 1942
1@ 80.5 M Fuel = NG/FS — Age = 1974

Table B62

CHPECON Results for Lone Star AAMP, File Prefix: LSA1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	24/24/24	10.245	12.249	4479	18813	30687	100
#2 Oil	24/24/24	12.880	15.400	4479	16707	38581	126
#6 Oil	24/24/24	10.343	12.366	4479	19107	30981	101
Stoker	16/28/28/28	23.032	29.538	35586	11376	68990	225
CWS	14/28/35/35	18.871	22.562	24546	14523	59069	192
COM	17/29/29/29	18.557	22.187	21086	18098	58086	189
FBC	13/26/33/33	22.074	26.392	33260	10601	66121	215

Base: Lone Star AAMP
File Prefix: LSA1 — L=(K# STEAM/HR)
PMCR: 70 L — M=(MBtu/HR)
Ave Mon. Load: 23 M
CHP #1 2@ 20 M Fuel = NG/FS2 — Age = 1942
1@ 30 M Fuel = NG/FS2 — Age = 1942

Table B63

CHPECON Results for Lone Star AAMP, File Prefix: LSA2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	30/30/30	9.477	11.331	4950	24409	37027	100
#2 Oil	30/30/30	12.112	14.481	4950	34735	47323	128
#6 Oil	30/30/30	9.575	11.448	4950	24822	37409	101
Stoker	21/35/35/35	19.940	22.829	37747	14079	74602	201
CWS	18/35/45/45	16.284	19.469	27078	18609	66484	179
COM	22/37/37/37	16.019	19.152	22780	23181	65403	177
FBC	17/33/42/42	18.517	22.139	35514	13759	72347	195

Base: Lone Star AAMP
File Prefix: LSA2 L=(K# STEAM/HR)
PMCR: 90 L M=(MBtu/HR)
Ave Mon. Load: 30 M
CHP #2 2@ 30 M Fuel = NG/FS2 Age = 1942
1@ 30 M Fuel = NG/FS2 Age = 1969

Table B64

CHPECON Results for Lone Star AAMP, File Prefix: LSA3

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	27/27/27	9.772	11.684	4783	22031	34362	100
#2 Oil	27/27/27	12.407	14.834	4783	31287	43628	127
#6 Oil	27/27/27	9.890	11.801	4783	22375	34706	101
Stoker	18/31/31/31	20.468	24.471	36684	12831	71971	209
CWS	16/32/40/40	17.212	20.579	25907	16879	63247	184
COM	19/33/33/33	16.886	20.189	21825	21031	62048	181
FBC	15/29/37/37	19.772	23.639	34412	12405	69524	202

Base: Lone Star AAMP
File Prefix: LSA3 L=(K# STEAM/HR)
PMCR: 80 L M=(MBtu/HR)
Ave Mon. Load: 27 M
CHP #3 1@ 20 M Fuel = NG/FS2 Age = 1942
2@ 30 M Fuel = NG/FS2 Age = 1942

Tpble B65

CHPECON Results for Lone Star AAMP, File Prefix: LSA4

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	24/24/24	10.245	12.249	4479	18813	30687	100
#2 Oil	24/24/24	12.880	15.400	4479	16707	38581	126
#6 Oil	24/24/24	10.343	12.366	4479	19107	30981	101
Stoker	16/28/28/28	23.032	29.538	35586	11376	68990	225
CWS	14/28/35/35	18.871	22.562	24546	14523	59069	192
COM	17/29/29/29	18.557	22.187	21086	18098	58086	189
FBC	13/26/33/33	22.074	26.392	33260	10601	66121	215

Base: Lone Star AAMP
File Prefix: LSA4 L=(K# STEAM/HR)
PMCR: 70 L M=(MBtu/HR)
Ave Mon. Load: 23 M
CHP #4 2@ 20 M Fuel = NG/FS2 Age = 1942
1@ 30 M Fuel = NG/FS2 Age = 1942

Table B66

CHPECON Results for Lone Star AAMP, File Prefix: LSA5

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	10.746	12.848	4281	16404	27989	100
#2 Oil	20/20/20	13.381	15.999	4281	23269	34853	125
#6 Oil	20/20/20	10.844	12.965	4281	16659	28244	101
Stoker	14/24/24/24	25.349	30.307	34584	10134	66025	236
CWS	12/24/30/30	20.495	24.504	23332	12795	55704	199
COM	15/25/25/25	20.118	24.054	20148	15951	54763	196
FBC	11/22/28/28	24.255	29.000	32191	9486	63177	226

Base: Lone Star AAMP
File Prefix: LSA5 L=(K# STEAM/HR)
PMCR: 60 L M=(MBtu/HR)
Ave Mon. Load: 20 M
CHP #5 2@ 30 M Fuel = NG/FS2 Age = 1942

Table B67

CHPECON Results for Mcalester AAMP, File Prefix: MAM

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	25/25/25	9.959	11.907	4550	20424	32425	100
#2 Oil	25/25/25	12.594	15.058	4550	29004	41005	126
#6 Oil	25/25/25	10.057	12.024	4550	20743	32744	101
Stoker	17/29/29/29	21.670	25.909	36071	12295	70555	218
CWS	15/29/37/37	17.902	21.404	24980	15770	60909	188
COM	18/31/31/31	17.542	20.973	21435	19232	59683	184
FBC	14/27/35/35	20.718	24.771	33823	11181	67454	208

Base: Mcalester AAMP
File Prefix: MAM
PMCR: 73.6 L
Ave Mon. Load: 25 M
CHP #1 2@ 8.4 M Fuel =NG/FS
2@ 11.7 M Fuel = NG/FS
2@ 16.7 M Fuel = NG/FS

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1967,1971
Age = 1971,1971
Age = 1975, 1984

Table B68

CHPECON Results for Natick R & D MA, File Prefix: NCR

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	38/38/38	10.746	12.848	5642	38292	32425	102
#2 Oil	38/38/38	11.914	14.245	5642	63913	41005	111
#6 Oil	38/38/38	9.455	11.305	5642	32070	32744	88
Stoker	26/44/44/44	18.365	21.958	44621	17664	70555	171
CWS	22/44/56/56	15.334	18.333	32857	22770	60909	149
COM	27/46/46/46	15.120	18.077	26795	29413	59683	147
FBC	21/41/52/52	17.479	20.898	41509	17088	67454	163

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	33/33/33	3263	15976	-36694	-17455
CWS	27/27/27	2151	20834	-47333	-24347
M-Coal	27/27/27	3745	15722	-36112	-16645

Base: Natick R & D MA
File Prefix: NCR
PMCR: 111.6 L
Ave Mon. Load: 37 M
CHP #1 3@ 37.1 M Fuel = FS6
1@ 0.3 M Fuel = FS

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1953
Age = 1981

Table B69

CHPECON Results for New Cumberland Army Depot PA, File Prefix: NAD

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	28/28/28	11.460	13.702	5182	28027	41790	100
#2 Oil	28/28/28	12.628	15.098	5182	33286	46049	110
#6 Oil	28/28/28	10.169	12.158	5182	24319	37082	89
Stoker	20/33/33/33	21.106	25.234	40978	12431	76963	184
CWS	17/34/43/43	17.735	21.204	28719	17228	67581	162
COM	21/35/35/35	17.416	20.823	24592	22494	66365	159
FBC	16/31/40/40	20.133	24.071	37936	12318	73416	170

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	16/20/20/20	3665	10744	-27878	-13469
CWS	13/16/16/16	2524	15581	-35398	-17293
M-Coal	13/16/16/16	4203	10520	-27297	-12544

Base: New Cumberland Army Depot PA
File Prefix: NAD L=(K# STEAM/HR)
PMCR: 84.8 L M=(MBtu/HR)
Ave Mon. Load: 28 M
CHP #1 3@ 22.3 M Fuel = FS6 Age = 1952
1@ 17.9 M Fuel = FS6 Age = 1977

Table B70

CHPECON Results for Newport AAMP IN, File Prefix: NAM1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	25/25/25	11.595	13.863	4863	25435	37751	100
#2 Oil	25/25/25	12.867	15.384	4863	28578	41893	111
#6 Oil	25/25/25	9.757	11.665	4863	19450	31765	84
Stoker	17/30/30/30	22.167	26.503	29977	9972	72171	191
CWS	15/30/38/38	18.432	22.037	28627	13851	62711	166
COM	18/31/31/31	17.966	21.481	24138	17977	61128	162
FBC	14/27/35/35	21.709	25.956	36838	11380	70681	187

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	16/20/20/20	3005	8131	-22680	-11544
CWS	13/16/16/16	1829	12174	-28078	-14074
M-Coal	13/16/16/16	3323	7911	-22067	-10833

Base: Newport AAMP IN
File Prefix: NAM1 L=(K# STEAM/HR)
PMCR: 75.3 L M=(MBtu/HR)
Ave Mon. Load: 25 M
CHP #1 3@ 25.1 M Fuel = NG/FS Age = 1959
1@ 17.9 M Fuel = FS6 Age = 1979

Table B71

CHPECON Results for Newport AAMP. IN, File Prefix: NAM2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	17/17/17	13.099	15.662	4403	17385	29002	100
#2 Oil	17/17/17	14.372	17.183	4403	20202	31819	110
#6 Oil	17/17/17	11.261	13.464	4403	13314	24931	86
Stoker	12/20/20/20	29.636	35.432	37247	7383	65611	226
CWS	10/20/25/25	23.235	27.780	25002	17214	53756	185
COM	12/21/21/21	22.870	27.343	22174	12685	52910	182
FBC	9/18/23/23	28.439	34.002	34023	7810	62962	217

Newport AAMP. IN
File Prefix: NAM 2 L=(K# STEAM/HR)
PMCR: 50.2 L M=(MBtu/HR)
Ave Mon. Load: 17 M
CHP #2 2@ 25.1 M Fuel = NG/FS Age = 1971

Table B72

CHPECON Results for Picatinny Arsenal, File Prefix: PAR1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	124/124/124	9.340	11.167	11539	123089	145468	100
#2 Oil	124/124/124	10.513	12.570	11539	141366	163744	113
#6 Oil	124/124/124	8.052	9.627	11539	103024	125403	86
Stoker	84/144/144/144	11.206	13.397	81979	50484	174524	120
CWS	72/144/184/184	10.841	12.961	72567	71777	176779	122
COM	88/151/151/151	10.581	12.650	51153	93558	172536	119
FBC	67/134/171/171	12.342	14.756	80809	69238	192226	132

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	45/144/144	5044	48230	-118672	-65397
CWS	37/120/120	4378	67203	-152423	-80841
M-Coal	37/120/120	6660	47303	-116390	-62426

Base: Picatinny Arsenal
File Prefix: PAR1 L=(K# STEAM/HR)
PMCR: 370 L M=(MBtu/HR)
Ave Mon. Load: 123 M
CHP #1 2@ 160 L Fuel = FS6 Age = 1952/1954
1@ 50 L Fuel = FS6 Age = 1971

Table B73

CHPECON Results for Picatinny Arsenal, File Prefix: PAR2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	17/17/17	13.255	15.848	4406	17727	29347	100
#2 Oil	17/17/17	14.423	17.244	4406	20313	31932	109
#6 Oil	17/17/17	11.964	14.304	4406	14868	26488	90
Stoker	12/20/20/20	30.417	36.367	37350	8439	67342	229
CWS	10/20/25/25	23.729	28.371	25050	10969	54900	187
COM	12/21/21/21	23.550	28.156	22199	14234	54484	186
FBC	9/18/23/23	28.423	33.982	34038	7617	62927	214

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	18/18/18	2830	6810	-16784	-7143
CWS	15/15/15	1611	9649	-21921	-10660
M-Coal	15/15/15	3037	6810	-16784	-6935

Base: Picatinny Arsenal
File Prefix: PAR2 L=(K# STEAM/HR)
PMCR: 50 L M=(MBtu/HR)
Ave Mon. Load: 17 M
CHP #2 1@ 50 L Fuel = FS6 Age = 1970

Table B74

CHPECON Results for Redstone Arsenal, File Prefix: RAR1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	78/78/78	7.966	9.524	8374	62299	79885	100
#2 Oil	78/78/78	10.601	12.675	8374	88724	106310	133
#6 Oil	78/78/78	8.064	9.642	8374	63281	80867	101
Stoker	53/90/90/90	12.337	14.751	58944	28736	123720	155
CWS	46/91/116/116	11.750	14.048	48994	46348	123133	154
COM	55/95/95/95	11.464	13.706	36178	58438	120134	150
FBC	42/84/107/107	11.862	14.182	55346	30448	118949	149

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	52/52/52/52	4674	26007	-70409	-39727
CWS	43/43/43/43	4079	42522	-92906	-46304
M-Coal	43/43/43/43	6000	26489	-64483	-31993

Base: Redstone Arsenal
File Prefix: RAR1 L=(K# STEAM/HR)
PMCR: 232 L M=(MBtu/HR)
Ave Mon. Load: 77 M
CHP #1 4@ 15.6 M Fuel = NG/FS Age = 1960

Table B75

CHPECON Results for Redstone Arsenal, File Prefix: RAR2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	72/72/72	8.057	9.633	7996	57475	74503	100
#2 Oil	72/72/72	10.692	12.784	7996	81842	98870	133
#6 Oil	72/72/72	8.155	9.750	7996	58380	75408	101
Stoker	49/83/83/83	12.805	15.310	56725	26517	118406	159
CWS	42/84/107/107	12.057	14.415	46606	42756	116504	156
COM	51/88/88/88	11.726	14.020	34668	53635	113309	152
FBC	39/78/99/99	17.740	21.210	55625	33523	122449	164

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	48/48/48/48	4551	17816	-48233	-25865
CWS	40/40/40/40	3888	29230	-63865	-30745
M-Coal	40/40/40/40	5779	18219	-44352	-20352

Base: Redstone Arsenal
File Prefix: RAR2 L=(K# STEAM/HR)
PMCR: 214 L M=(MBtu/HR)
Ave Mon. Load: 71 M
CHP #2 4@ 15.6 M Fuel = NG/FS Age = 1942

Table B76

CHPECON Results for Riverbank AAMP CA, File Prefix: RBA

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	24/24/24	11.829	14.143	4987	23051	35433	100
#2 Oil	24/24/24	13.022	15.569	4987	26623	39005	110
#6 Oil	24/24/24	9.740	11.689	4987	167937	29175	82
Stoker	16/28/28/28	25.286	30.230	41839	11804	75735	214
CWS	14/28/35/35	20.689	24.736	129817	14798	64760	183
COM	17/29/29/29	19.568	23.396	25641	16275	61252	173
FBC	13/26/33/33	24.015	28.713	37386	11658	71934	203

Riverbank AAMP CA
File Prefix: RBA L=(K# STEAM/HR)
PMCR: 70.1 L M=(MBtu/HR)
Ave Mon. Load: 23.4 M
CHP #1 5@ 10 M Fuel =NG/PPG Age = 1943
CHP #1 1@ 20.1 M Fuel = NG/PPG Age = 1969

Table B77

CHPECON Results for Ravenna AAMP, File Prefix: RVA

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	26/26/26	11.478	13.714	4943	26443	38867	100
#2 Oil	26/26/26	12.751	15.245	4943	30752	43175	111
#6 Oil	26/26/26	9.640	11.525	4943	20218	32642	84
Stoker	18/30/30/30	21.686	25.928	40711	9579	73431	189
CWS	15/30/39/39	18.137	21.685	29165	14521	64178	165
COM	14/28/36/36	17.800	21.282	24622	18770	62985	162
FBC	67/134/171/171	20.446	24.445	37152	9480	69231	178

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	12/12/14/14/14	4155	7682	-21071	-9233
CWS	10/10/12/12/12	2666	12797	-29515	-14050
M-Coal	10/10/12/12/12	4614	8787	-21101	-7698

Ravenna AAMP
File Prefix: RVA — L=(K# STEAM/HR)
PMCR: 77.1 L — M=(MBtu/HR)
Ave Mon. Load: 26 M
CHP #1 3@ 16.3 L Fuel = FS — Age = 1941
CHP #1 2@ 14.1 M Fuel = Coal — Age = 1941

Table B78

CHPECON Results for Rocky Mountain Arsenal, File Prefix: RMA1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	77/77/77	9.380	11.215	8258	76598	94064	100
#2 Oil	77/77/77	10.572	12.640	8258	88556	106022	113
#6 Oil	77/77/77	9.291	8.717	8258	55649	73114	78
Stoker	52/90/90/90	11.951	14.289	57188	30309	119848	127
CWS	45/90/115/115	11.747	14.044	48101	47725	123099	131
COM	55/94/94/94	10.796	12.908	35529	52596	113136	120
FBC	42/83/106/106	11.860	14.180	54510	31785	118938	126

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	69/69/69	4086	28220	-60376	-28069
CWS	57/57/57	3177	44527	-81617	-33912
M-Coal	57/57/57	5090	29048	-62102	-27964

Base: Rocky Mountain Arsenal
File Prefix: RMA1 — L=(K# STEAM/HR)
PMCR: 230 L — M=(MBtu/HR)
Ave Mon. Load: 77 M
CHP #1 2@ 115 L Fuel = NG/FS — Age = 1942

Table B79

CHPECON Results for Rocky Mountain Arsenal, File Prefix: RMA2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	124/124/124	9.014	10.776	11062	122193	144386	100
#2 Oil	124/124/124	10.206	12.202	11062	141297	163489	113
#6 Oil	124/124/124	6.925	8.279	11062	88736	110922	77
Stoker	84/144/144/144	10.191	12.184	76169	47654	163251	113
CWS	72/144/184/184	10.563	12.621	67371	75554	176821	122
COM	88/151/151/151	9.647	11.534	47655	83125	161487	112
FBC	67/134/171/171	10.249	12.254	73983	50528	164186	114

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	18/90/112/112	5622	45196	-96197	-45878
CWS	15/75/93/93	5538	70906	-128967	-53522
M-Coal	15/75/93/93	7687	46243	-98862	-44932

Rocky Mountain Arsenal CO.
File Prefix: RMA2 L=(K# STEAM/HR)
PMCR: 370 L M=(MBtu/HR)
Ave Mon. Load: 123 M
CHP #2 2@ 125 L Fuel =NAG/FS Age = 1942
CHP #2 1@ 100 M Fuel = NAG/FS Age = 1968
CHP #2 1@ 20 M Fuel = NAG/FS Age = 1984

Table B80

CHPECON Results for Scranton AAMP, File Prefix: SAM

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	29/29/29	11.460	13.702	5182	29027	41790	100
#2 Oil	29/29/29	12.628	15.098	5182	33286	46049	110
#6 Oil	29/29/29	10.169	12.158	5182	24319	37082	89
Stoker	20/33/33/33	21.202	25.349	40978	12782	77314	185
CWS	17/34/43/43	17.840	21.330	29810	17230	67983	163
COM	21/35/35/35	17.612	21.057	24683	22696	67112	161
FBC	16/31/40/40	20.170	24.115	37703	12792	73549	176

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	19/19/36	3074	11110	-27877	-13692
CWS	16/30/30	1916	15580	-35397	-17900
M-Coal	16/30/30	3436	10878	-27296	-12980

Scranton AAMP
File Prefix: SAM L=(K# STEAM/HR)
PMCR: 85 L M=(MBtu/HR)
Ave Mon. Load: 28.5 M
CHP #1 1@ 41 L Fuel = NG/FS Age = 1968
CHP #1 2@ 22 M Fuel = NG/FS Age = 1961

Table B81

CHPECON Results for Sunflower AAMP, File Prefix: SFA

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	200/200/200	8.677	10.374	15159	251919	282521	100
#2 Oil	200/200/200	9.499	11.896	15159	293345	323947	115
#6 Oil	200/200/200	6.839	8.177	15159	92068	222670	79
Stoker	135/233/233/233	7.654	9.151	100676	94839	249214	88
CWS	117/234/299/299	7.769	9.288	90577	132181	264330	94
COM	142/245/245/245	7.970	9.528	61362	171921	271163	96
FBC	108/216/276/276	7.398	8.845	91855	101820	240884	85

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	225/225/225	6668	90517	-213658	-116472
CWS	187/187/187	6396	122605	-282761	-153759
M-Coal	187/187/187	9308	89038	-210167	-11820

Sunflower AAMP
File Prefix: SFA
PMCR: 600 L
Ave Mon. Load: 250 M
CHP #1 3@ 250 L Fuel = NAG

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1942

Table B82

CHPECON Results for Toole AD, File Prefix: TAD

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	12.226	14.617	4458	20082	31844	100
#2 Oil	20/20/20	13.418	16.043	4458	23188	34950	115
#6 Oil	20/20/20	10.136	12.119	4458	14640	26402	79
Stoker	14/24/24/24	25.915	30.984	36813	9287	67500	88
CWS	12/24/30/30	21.269	25.426	25213	13014	57885	94
COM	15/25/25/25	20.218	24.173	21778	14335	55032	96
FBC	11/22/28/28	24.669	29.494	33805	9043	64254	85

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	18/18/18	2900	7676	-16047	-5470
CWS	15/15/15	1698	11614	-21307	-7983
M-Coal	15/15/15	3151	7436	-15545	-4957

Toole AD
File Prefix: TAD
PMCR: 60.3 L
Ave Mon. Load: 20.1 M
CHP #1 3@ 20.1 M Fuel = FSR/FS2

L=(K# STEAM/HR)
M=(MBtu/HR)

Age = 1972

Table B83

CHPECON Results for Twin City AAMP. MN., File Prefix: TAM1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	41/41/41	10.424	12.463	6096	41549	55659	100
#2 Oil	41/41/41	11.696	13.984	6096	48343	62453	115
#6 Oil	41/41/41	8.585	10.265	6096	31734	45843	82
Stoker	28/48/48/48	16.883	20.185	46687	18068	90147	162
CWS	24/48/62/62	14.311	17.110	34477	22441	79853	143
COM	30/51/51/51	14.016	16.757	28528	28047	78206	141
FBC	23/45/57/57	16.223	19.356	43186	18033	86625	156

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	36/36/36	3339	16193	-17391	-17877
CWS	30/30/30	2246	20214	-46619	-24158
M-Coal	30/30/30	3870	15908	-36778	-16999

Twin City AAMP. MN.
File Prefix: TAM1 L=(K# STEAM/HR)
PMCR: 123 L M=(MBtu/HR)
Ave Mon. Load: 41.1 M
CHP #1 3@ 41.1 M Fuel = NG/FS= 1942

Table B84

CHPECON Results for Twin City AAMP, File Prefix: TAM2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	33/33/33	10.857	12.980	5454	33479	46660	100
#2 Oil	33/33/33	12.129	14.502	5454	38947	52128	112
#6 Oil	33/33/33	9.019	10.782	5454	25578	38759	83
Stoker	23/39/39/39	18.790	22.465	42812	14822	80752	173
CWS	20/39/39/39	15.771	18.857	31781	18032	70832	152
COM	24/41/41/41	15.520	18.556	26261	23513	69704	149
FBC	18/36/46/46	18.035	21.563	39394	14981	77510	166

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	29/29/29	3172	12991	-30035	-13071
CWS	24/24/24	2037	16079	-37083	-18966
M-Coal	24/24/24	3596	12726	-29422	-13099

Twin City AAMP
File Prefix: TAM2 L=(K# STEAM/HR)
PMCR: 99 L M=(MBtu/HR)
Ave Mon. Load: 33 M
CHP #2 3@ 33 M Fuel = Age =1941

Table B85

CHPECON Results for U.S. Military Academy, File Prefix: UMA

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	134/134/134	9.290	11.106	12454	136963	160902	100
#2 Oil	134/134/134	10.457	12.503	12454	157194	181133	113
#6 Oil	134/134/134	7.998	4.563	12454	114600	138540	86
Stoker	90/155/155/155	11.029	13.186	89519	56798	191032	119
CWS	78/186/199/199	10.715	12.811	78592	79710	193936	121
COM	95/163/163/163	10.565	12.632	54773	104213	191238	119
FBC	92/44/184/184	10.711	12.807	83755	60005	185536	115

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	180/180/180	5272	54346	-131901	-72282
CWS	150/150/150	4656	74702	-169715	-90356
M-Coal	150/150/150	7028	47822	-118147	-63296

U.S. Military Academy
File Prefix: UMA — L=(K# STEAM/HR)
PMCR: 400 L — M=(MBtu/HR)
Ave Mon. Load: 133 M
CHP #1 2@ 200 M Fuel = FS5 — Age = 1968

Table B86

CHPECON Results for Walter Reed Army Medical Center, File Prefix: WMC1

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	20/20/20	10.789	12.900	4390	10411	28102	100
#2 Oil	20/20/20	13.425	16.051	4390	23275	34967	124
#6 Oil	20/20/20	10.887	13.017	4390	16666	28357	101
Stoker	14/23/23/23	25.988	31.071	36032	9697	67690	240
CWS	12/23/29/29	20.791	24.837	24128	12676	56589	201
COM	14/24/24/24	20.638	24.675	21178	15883	56174	200
FBC	11/21/27/27	24.585	29.395	33094	9367	64037	228

Retrofit Technology	Bo	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker		2886	7698	-19004	-8419
CWS		1681	10977	-23985	-11326
M-Coal		3129	7465	-18428	-7834

Base: Walter Reed Army Medical Center
File Prefix: WMC1 — L=(K# STEAM/HR)
PMCR: 58 L — M=(MBtu/HR)
Ave Mon. Load: 19.3 M
CHP #1 1@ 21 L Fuel = FS6 — Age = 1938
1@ 24 L Fuel = FS6 — Age = 1982
1@ 13 L Fuel = FS2 — Age = 1938

Table B87

CHPECON Results for Walter Reed Medical Center , File Prefix: WMC2

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	107/107/107	7.697	9.202	10029	85649	106250	100
#2 Oil	107/107/107	10.332	12.353	10029	122029	142629	134
#6 Oil	107/107/107	7.795	9.319	10029	87001	107603	101
Stoker	72/124/124/124	11.205	13.397	71098	43355	154691	146
CWS	63/125/159/159	10.874	13.000	61265	63568	156864	148
COM	76/131/131/131	10.566	12.633	43461	79867	152428	143
FBC	58/116/148/148	11.014	13.168	67845	46188	152045	143

Walter Reed Medical Center
File Prefix: WMC2 L=(K# STEAM/HR)
PMCR: 320 L M=(MBtu/HR)
Ave Mon. Load: 106 M
CHP #2 2@ 100 L Fuel = NG/FS2 Age = 1987
CHP #2 2@ 60L Fuel =NG/FS Age = 1973

Table B88

CHPECON Results for Watervliet, File Prefix: WAR

New Plant Technology	Boiler	$/MBtu	$/K#STM	K$INV	K$Fuel	K$LCC	LCC/R
Gas	49/49/49	10.303	12.319	6592	49590	64408	100
#2 Oil	49/49/49	11.471	13.715	6592	7855	71710	111
#6 Oil	49/49/49	90.125	10.775	6592	41519	56338	87
Stoker	33/57/57/57	15.973	19.097	50301	21731	99848	155
CWS	29/57/57/57	14.097	16.855	39469	28248	92091	143
COM	35/60/60/60	13.876	16.590	30849	37954	90645	141
FBC	27/53/68/68	15.210	18.246	46459	22141	95397	148

Retrofit Technology	Boiler	K$INV	K$Coal	K$Hvy Oil	Savings
Stoker	18/21/31/31	4084	19943	-47531	-23503
CWS	15/18/18/26/26	3169	26953	-61236	-31112
M-Coal	15/18/26/26	4948	1970	-46981	-22302

Base: Watervliet
File Prefix: WAR L=(K# STEAM/HR)
PMCR: 146 L M=(MBtu/HR)
Ave Mon. Load: 48 M
CHP #6 2@ 24.2 M L Fuel = FS Age = 1952
CHP #6 2@ 35.2 M Fuel = FS Age = 1956, 1957
CHP #6 1@ 7.0 M Fuel = FS Age = 1978

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